VOL. XXIII. Nº 1. JANUARY 1938

MECCANO MAGAZINE

LIFTING THE CRUCIBLE

6D.

DRIVER CLARKE SAYS "IT'S FINE!"

The new HORNBY

SCALE MODEL OF
L·M·S RECORD-BREAKER

"Princess Elizabeth"

Four hundred miles non-stop at an average of 70 m.p.h.; maximum speeds of 95 m.p.h.; Beattock bank and Shap incline surmounted at 66 m.p.h. with a 260-ton load! These remarkable feats were performed by L.M.S. 4-6-2 *"Princess Elizabeth,"* in charge of Driver T. J. Clarke, on a special run in November 1936.

Think of the thrill of owning a model of such an engine; not merely a perfect reproduction in miniature, but one having the same qualities of power, speed and efficiency! This is now made possible by the latest product of Meccano Ltd.—the magnificent Hornby scale model locomotive *"Princess Elizabeth."* Look at the photograph above! What a splendid appearance the model has with its massive six-coupled driving wheels, fascinating valve gear, and Royal nameplate! It is driven by a 20-volt electric motor, fitted with the world-famous Hornby Remote Control.

Price, complete with tender in special presentation box, £5 5s. 0d

The model may be purchased also through the new Hornby Deferred Payments Scheme Ask your dealer for details. (Not available outside Great Britain and Northern Ireland.)

HORNBY TRAINS

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

Hamley's News

· HAMLEY · BROTHERS · LTD · ESTABLISHED · 1760 ·

200-202, REGENT ST., LONDON, W.1. **OUR ONLY ADDRESS**

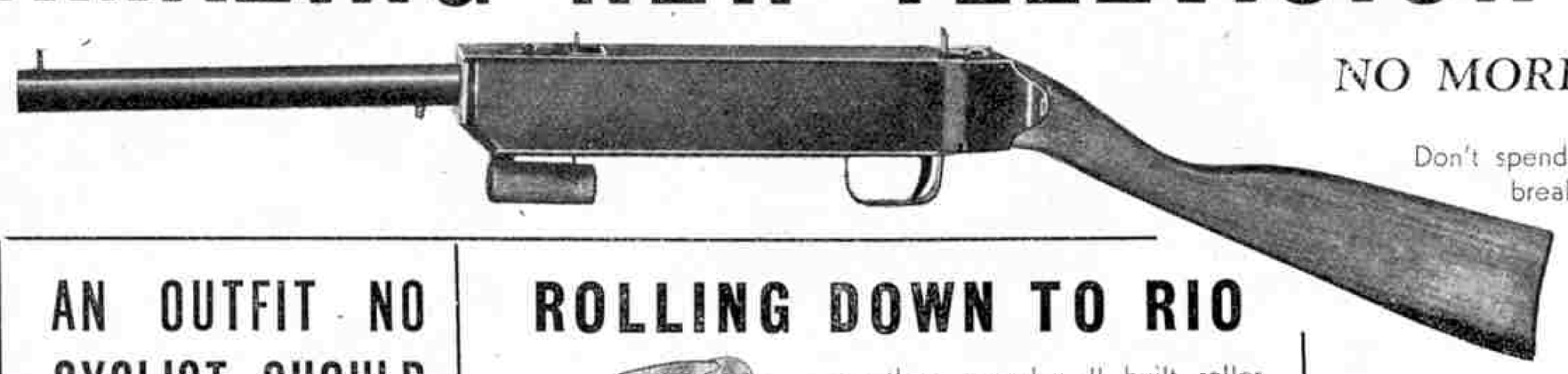
Telephone: REGENT 3161

No. 28 *January, 1938*

ARE YOU A TELEVISION SHOT?

MYSTERIES OF MAGNETISM REVEALED!

AMAZING NEW TELEVISION RIFLE!!



NO MORE BREAKAGES!

Don't spend your pocket money on replacing breakages. Use this wonderful new rifle. It projects a target on to the wall and when fired a black spot appears which records your shot. The wonder of the year!

Foreign. PRICE **10/6** Post 9d.

AN OUTFIT NO CYCLIST SHOULD LACK

Make sure that your bicycle cannot be stolen by fitting it with this grand little safety lock. Can only be opened by finding the right four word key letter. Also durable cyclometer easily fitted. Extra accessory is a spanner which will fit every nut on your bicycle.

PRICE **4/6** Post 3d.

ROLLING DOWN TO RIO

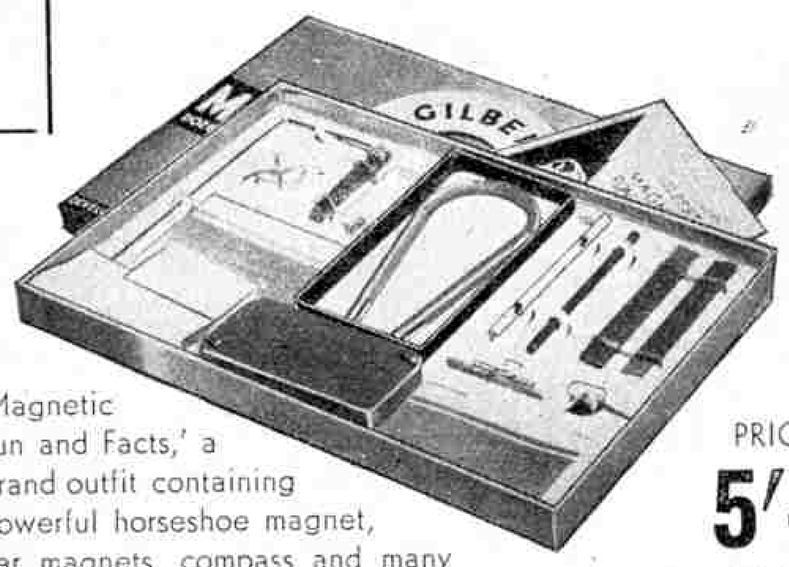
on these grand well built roller skates. Fitted with ball bearing wheels and completely self steering. No one should be without them.

PRICE **12/6** Post 6d.

HAMLEY'S MODEL AEROPLANE EXHIBITION

Come and see our wonderful Exhibition of Model Aeroplanes being held from January 6th to January 15th, 1938. Wonderful Models of every type of 'plane!! Also come to the Prize-giving on January 6th and clap the lucky prize winners in our 2nd Annual Model Aeroplane Competition!!

MAGNETISE YOUR MIND



'Magnetic Fun and Facts,' a grand outfit containing powerful horseshoe magnet, bar magnets, compass and many other parts. Learn all about magnetism and electricity in this amusing way!

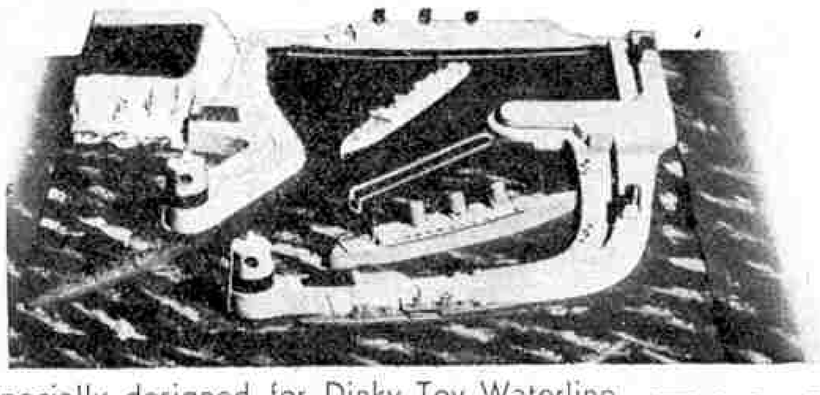
PRICE **5/-** Post 6d. Foreign.

TOOLS for All Occasions

Here's a topping set of tools for every emergency. A perfect pocket set with wood handle into which 7 tools fit. Everyone should carry one!

Foreign. PRICE **2/9** Post 4d.

Fine Harbour *for* 'Dinky Boats'



Specially designed for Dinky Toy Waterline Model Boats, this fine harbour is fitted with electric harbour lights, dry dock and model of *Queen Mary*. Boats extra, size 24" x 14". PRICE **5/11** Post 6d.

JOKES FOR YOUR NEW YEAR PARTY

SPARK CAMERA

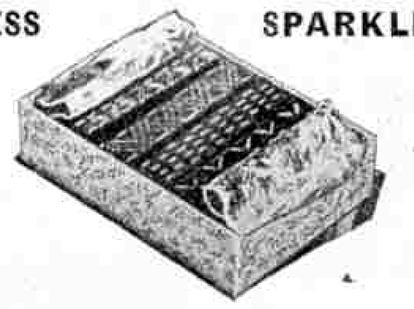
Pretend to take your friend's photo and see how he jumps at the flash! Foreign

PRICE Post 3d. **1/-**

SNAKE WIRELESS

Shaped exactly like a wireless set but when tuned in a snake jumps out! Roars of fun! Foreign.

PRICE Post 3d. **6d.**



SPARKLING CHOCOLATES

Fool your pals with these chocolates! Excellent flavours!! Foreign.

PRICE Post 3d. **1/9**

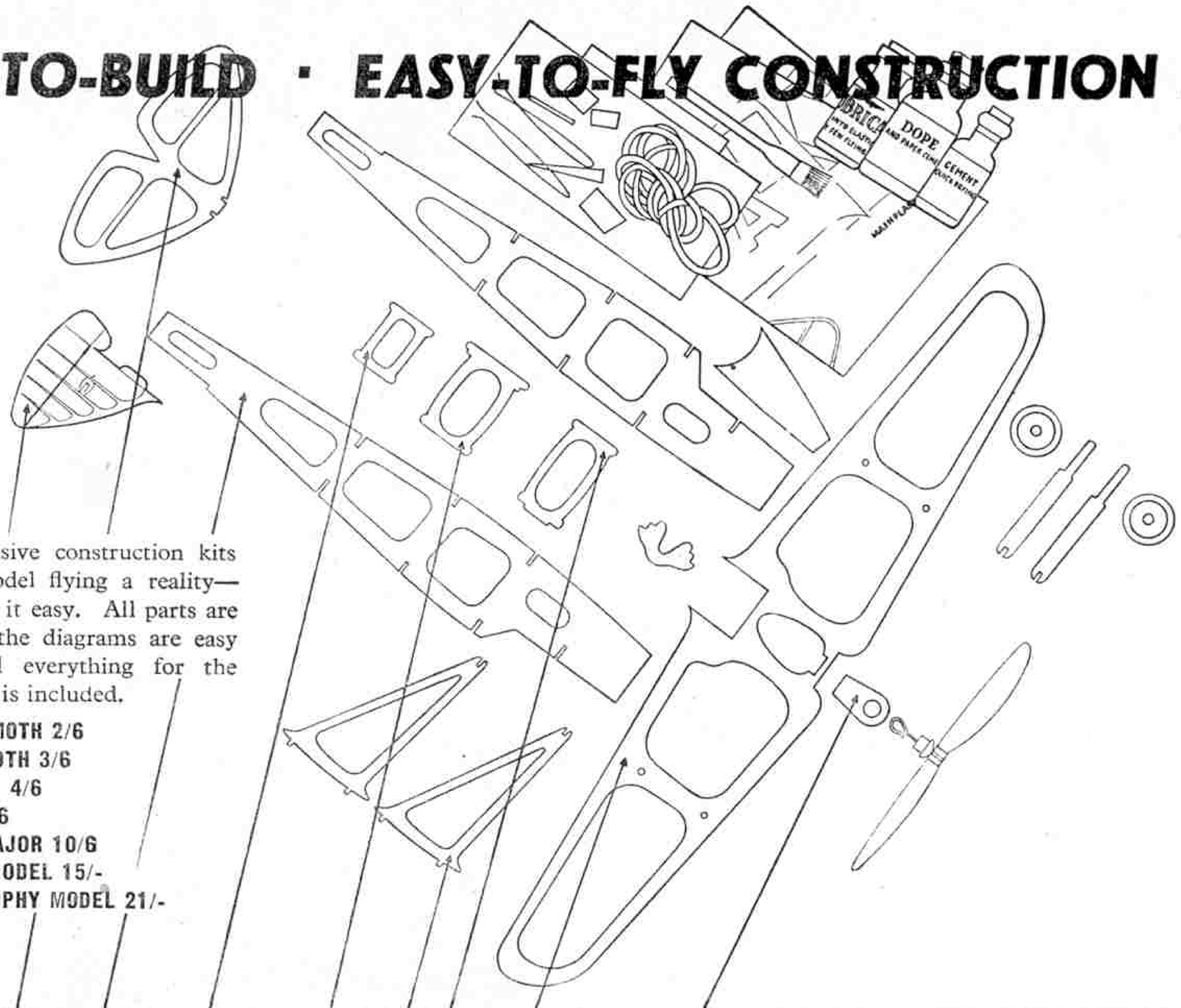
MYSTIC BOTTLES

Will perform the most amazing tricks. Try them on your friends!

Post 3d. PRICE **1/6**

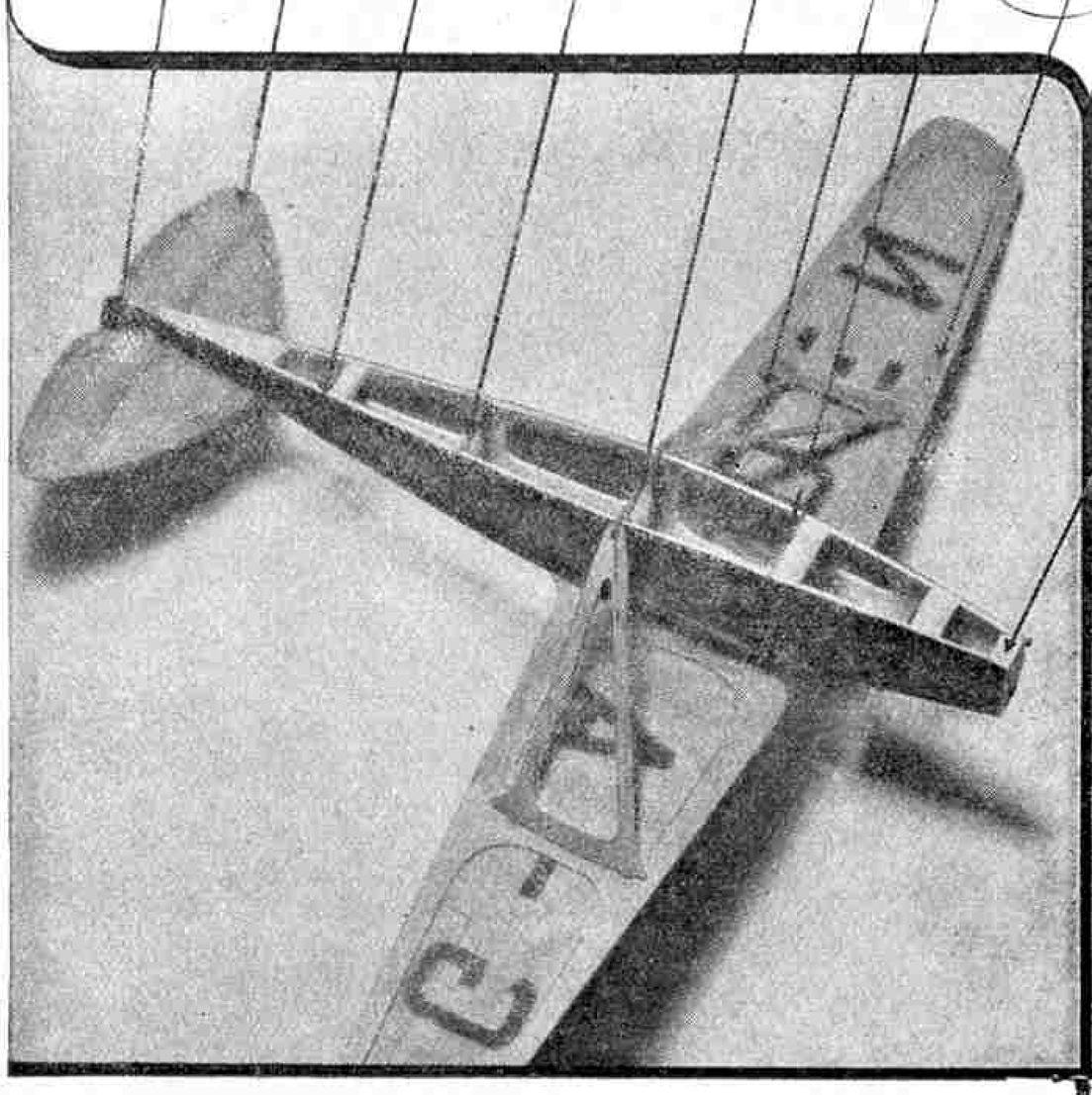
Boys! You must see the NEW Meccano Manuals!
You will be amazed at the wonderful new models!
MECCANO
INSTRUCTIONS FOR No. 3 OUTFIT
New parts.. new designs.. new thrills!
Ask your dealer to show you the New Manuals- and the New Meccano
The world's greatest toy is waiting for you

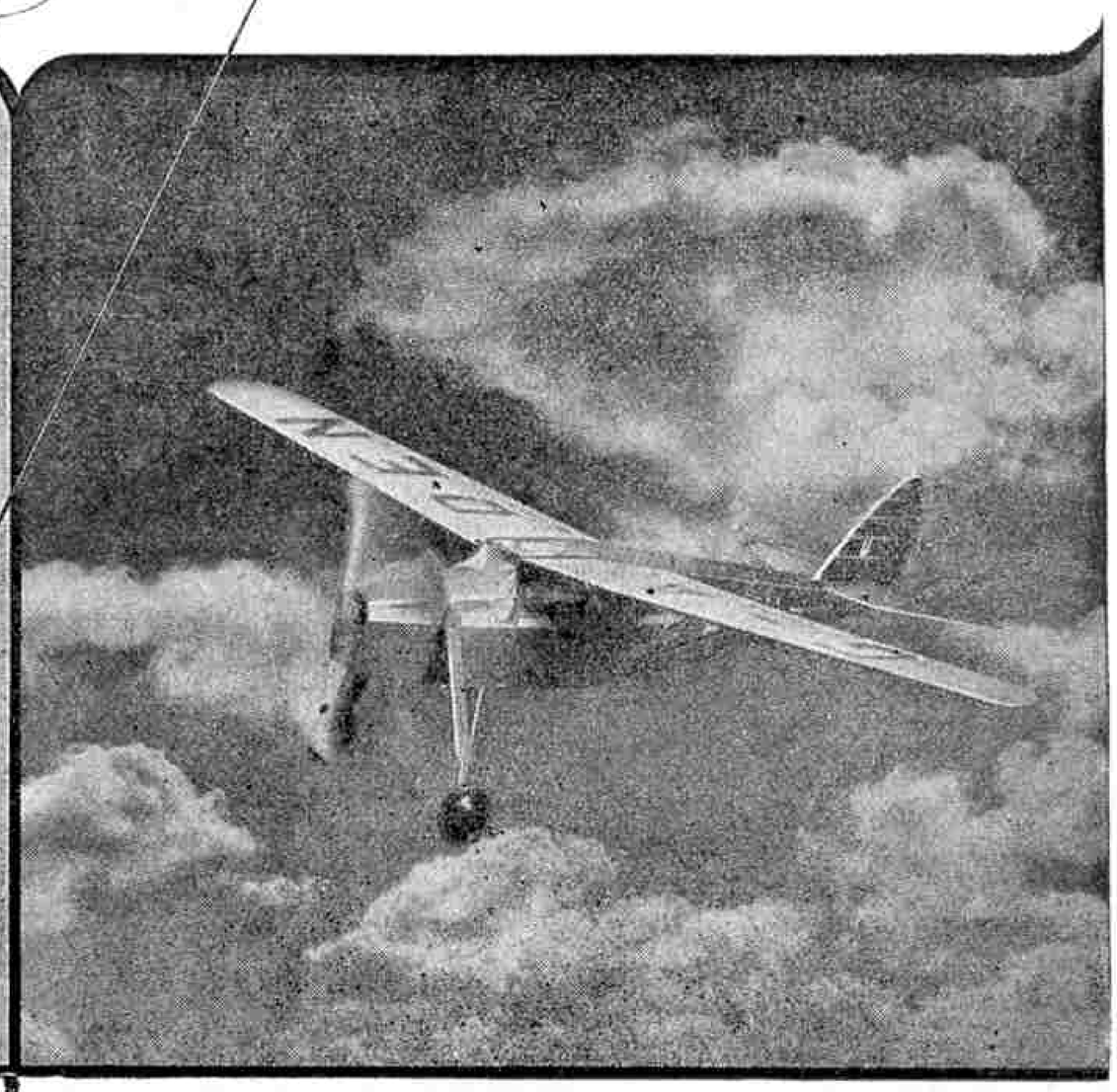
EASY-TO-BUILD · EASY-TO-FLY CONSTRUCTION KITS



These inexpensive construction kits make scale model flying a reality—and they make it easy. All parts are cut to shape, the diagrams are easy to follow and everything for the finished model is included.

D.H. LEOPARD MOTH 2/6
D.H. HORNET MOTH 3/6
HAWKER DEMON 4/6
FAIREY III F. 5/6
MILES HAWK MAJOR 10/6
COMPETITION MODEL 15/-
WAKEFIELD TROPHY MODEL 21/-





OBTAINABLE AT ALL GOOD TOY SHOPS AND STORES

FROG

MODEL AIRCRAFT
Covered by World Patents granted and pending.
Made in England by International Model Aircraft Ltd.
Sole Concessionaires :
LINES BROS. LTD., MORDEN RD., MERTON, S.W.19

COUPON To Lines Bros. Ltd. (Dept. 5)
Morden Road London, S.W.19

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.

NAME .....

ADDRESS .....

TRADE MARK REGD.

1/38

HORNBY COMPLETE MODEL RAILWAYS

Complete Equipment for commencing the fascinating Model Railway Hobby

Hornby Complete Model Railway Sets provide the simplest way of beginning the thrilling Hornby Railway hobby. Four Sets are available and each is complete in itself; everything is there, ready for use as soon as you get it home.

Unpack the box, then lay out the rails and accessories as shown in the illustration provided, put the locomotive and coaches or wagons on the track, and begin to run your own railway! It's the greatest fun in the world!

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

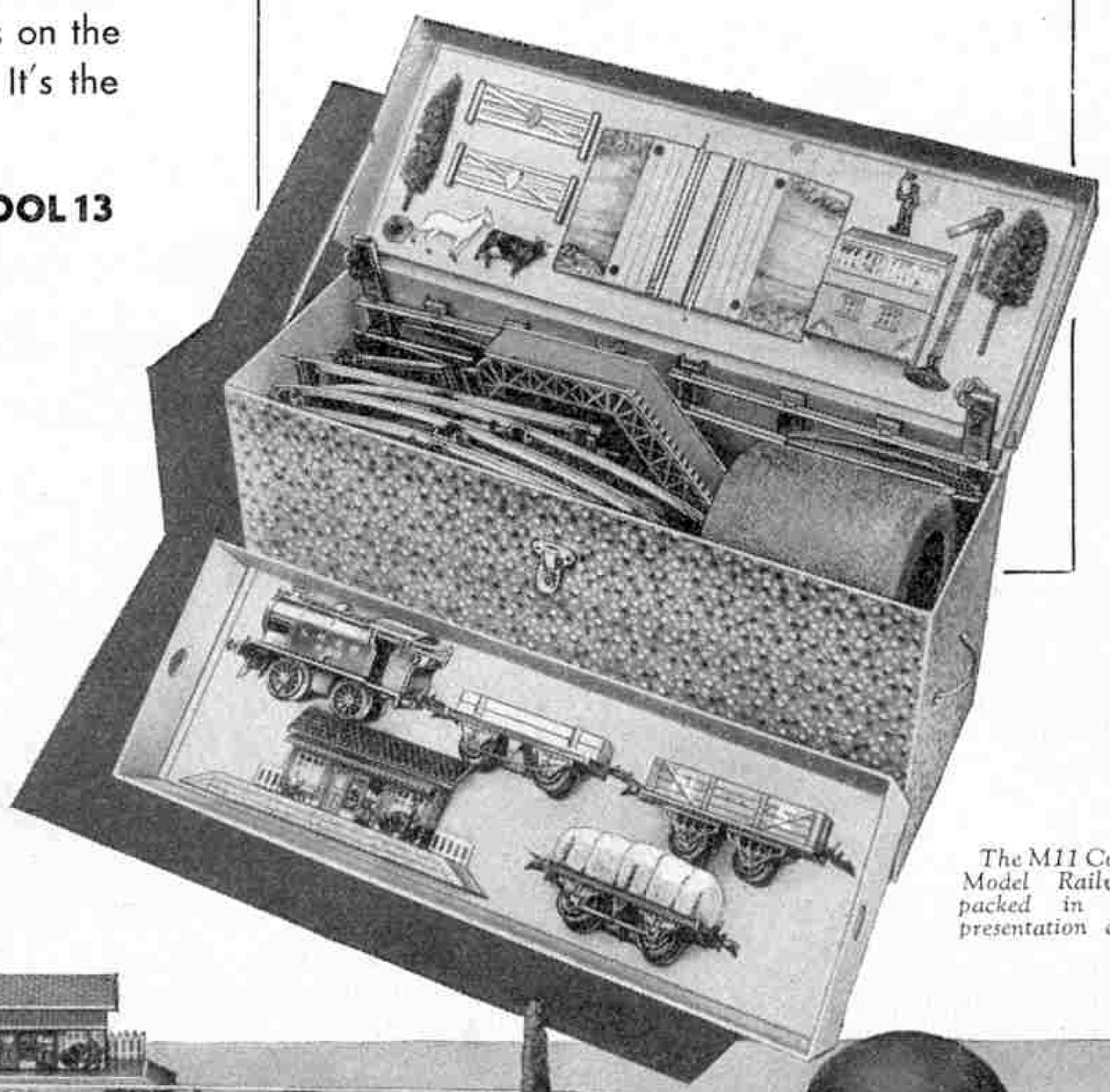
THE RANGE OF HORNBY COMPLETE MODEL RAILWAYS

M8 Complete Model Railway
Consists of Locomotive (non-reversing) and Tender, Track, Goods Wagons, and other components for an attractive small home railway. Packed in carton. Price **8/11**

M9 Complete Model Railway
The Locomotive and Tender are similar to those in the M8 Set. There are Passenger Coaches in place of the Goods Wagons, more Track and extra components. Packed in carton. Price **11/6**

M10 Complete Model Railway
A larger Set, packed in a special cabinet. A fine range of components is included in addition to a Locomotive (non-reversing), Tender and Coaches. Price **18/9**

M11 Complete Model Railway
This is the best of the four Sets. It includes a fine reversing Tank Locomotive and all the accessories to make the splendid model railway illustrated below. The neat cabinet in which the Set is packed is shown in the reproduction herewith. Price **25/-**

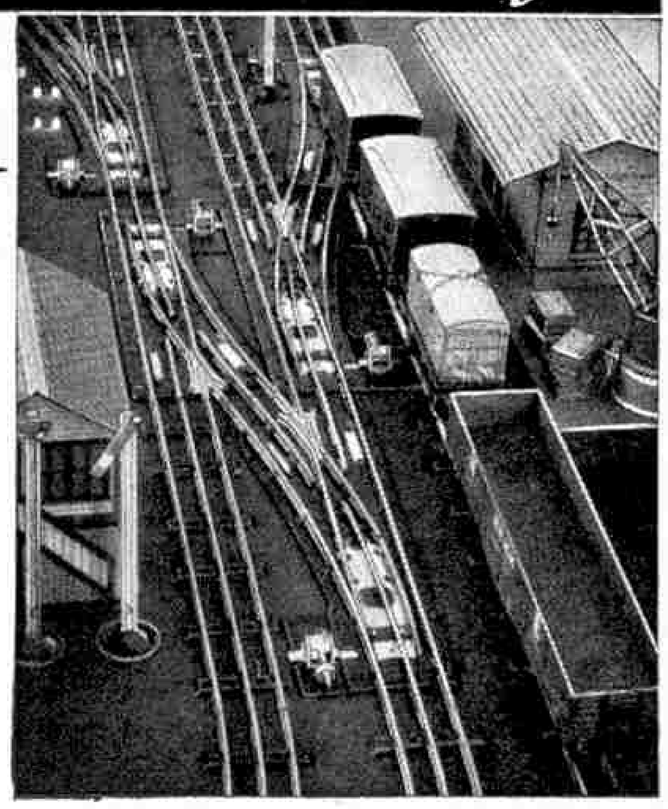


The M11 Complete Model Railway as packed in special presentation cabinet.

How effectively the components of the M11 Complete Model Railway can be laid out is shewn in this illustration.

The PERFECT track for Electric Model Railways

HORNBY SOLID STEEL RAILS



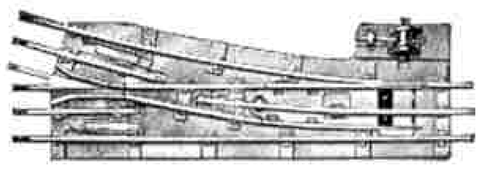
Although our standard tinplate rails are the acknowledged best of their class, we have felt that in order to do justice to the speed and hauling power of our locomotives, especially "PRINCESS ELIZABETH" and E420 "ETON," a drawn steel rail was essential. Our object was to produce the perfect miniature railway track, and we have achieved our aim in the new system of electric steel rails and points that we introduced recently. These rails are of the very highest quality, yet are sold at reasonable prices. We are confident that they will give satisfaction, not only to Hornby Train users, but to all model railway enthusiasts. The track is joined up by means of fishplates which are supplied with each rail.

ELECTRIC STRAIGHT RAILS

EB3	Straight Rails (Length 23 in.)	each **2′8**
EB3½	Straight Half Rails	„ **1′7**
EB3¼	Straight Quarter Rails	„ **1′-**
	TSR Electrical Terminal for Solid Section Rail	per pair **4d.**

ELECTRIC CURVED RAILS

EA3	Curved Rails	each **2′8**
EA3½	Curved Half Rails	„ **1′7**



ELECTRIC POINTS (Hand Operated)

EPR3	Right-hand Points ...	each **8′3**
EPL3	Left-hand Points ...	„ **8′3**

FISHPLATES

FP For joining up track ... Price, doz. **6d.**

Many owners of Hornby Railways with tinplate rails will want to add solid steel track to their layouts. To enable them to do this special adapting pieces are available.

AP Adapting Pieces, per box of six ... **1′-**

Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

QUALITY FEATURES OF NEW ELECTRIC SOLID STEEL TRACK

1. RAILS. Solid drawn steel section, zinc coated to prevent rust and to ensure good electrical contact. The space required for a circle made up of 10 Curved rails is 6 ft. 8 in.
2. SLEEPERS. Pressed steel, of similar design to the steel sleepers used on actual railways. Each sleeper is pierced so that the track can be screwed down to a wood base.
3. POINTS. On solid base, providing the greatest possible rigidity. Lever movement simple and positive. Right-hand and Left-hand points available.

A fascinating building hobby

FOR BOYS AND GIRLS

Dinky Builder Outfits are great favourites with boys and girls. The parts contained in them provide a most fascinating constructional hobby, specially designed for the younger children. These brightly coloured parts are fitted together in a most simple and ingenious manner without the use of any nuts and bolts.

There are four Outfits in the series, Nos. O, 1, 2 and 3, in all of which the parts are beautifully enamelled in striking colours, giving a distinction to the models that is outstandingly attractive.

No. O DINKY BUILDER OUTFIT

This is an excellent Outfit with which a splendid range of models can be built. The Instruction Folder included gives examples of 40 delightful models Price **2/6**

No. 1 DINKY BUILDER OUTFIT

This fine Outfit contains a varied selection of parts, including a set of four road wheels for constructing miniature wheeled toys, many examples of which are illustrated in the Instruction Manual. These instructions show a total of 56 fine models that any boy or girl can build. Price **4/11**

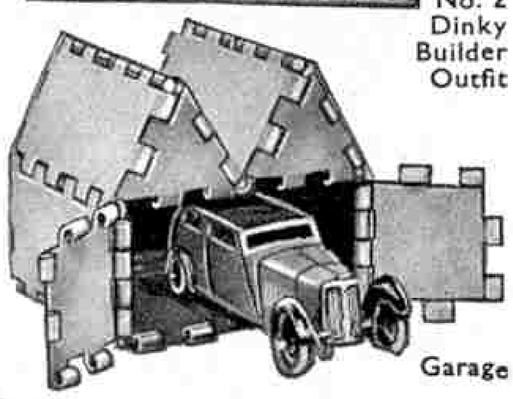
No. 2 DINKY BUILDER OUTFIT

The No. 2 Dinky Builder Outfit contains a comprehensive selection of parts with which all the No. O and No. 1 Outfits models can be built. In addition, the parts in this fine Outfit make possible the construction of six groups of miniature model furniture. Full instructions are given in the Instruction Manual included in the Outfit. Price **7/9**

DINKY BUILDER "A"

The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1, No. 2 and No. 3 may be supplemented. Price **1/-**

No. 2 Dinky Builder Outfit



Garage

No. 3 DINKY BUILDER OUTFIT

This is the largest Outfit in the series, and its model-building possibilities are almost limitless. It is the ideal gift for young boys and girls.

The parts contained in this Outfit can be used over and over again to make hundreds of different models, including Towers, Bridges, Buildings of all types, Furniture, Aeroplanes, etc. Complete instructions are provided. Price **10/9**

DINKY BUILDER

Manufactured by Meccano Limited, Binns Road, Liverpool 13

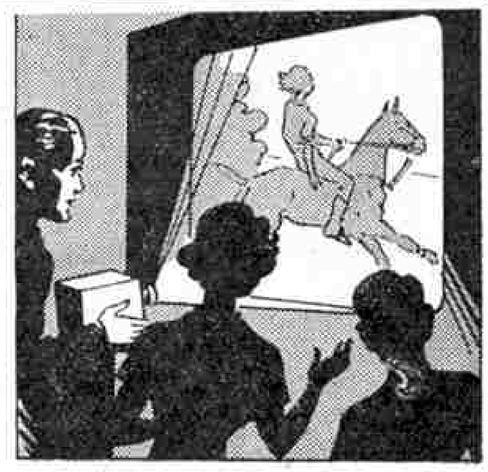
PRICES OF MECCANO & HORNBY PRODUCTS

Increases in the cost of materials and labour have now made it necessary to increase the prices of certain Meccano and Hornby products.

As the new prices will take effect on 1st January, 1938, but are not available for publication as we go to press, readers are requested to apply to their Meccano dealers or direct to us for the latest price list.

MECCANO LIMITED
BINNS ROAD, LIVERPOOL 13

People and things come to life so easily on a



MILL'S EPISCOPE

Make up your own home "cinema" programme with family "snaps" cuttings of plain and coloured pictures from magazines, microscope slides, cigarette cards, sketches, stamps, coins, all kinds of *opaque* objects, and see them as brilliant pictures, size 30 in. x 20 in., projected on a screen by means of the Mill's Episcope "Minor."

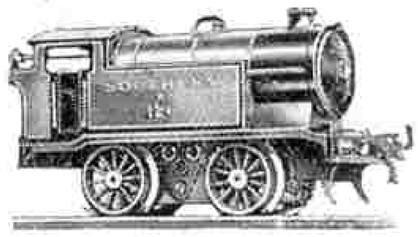
Get this battery-operated model, employing twin flashlamp bulbs, powerful reflector and distortionless lens, from leading stores, or postage extra from

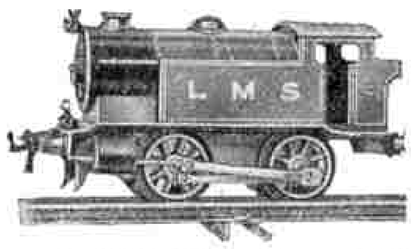
MILLS BROTHERS (Model Engineers) LTD.
DEPT. F.S., ST. MARY'S ROAD SHEFFIELD

Other models:
MAJOR, **25/-** JUNIOR, **12/6**

HORNBY
TANK LOCOMOTIVES

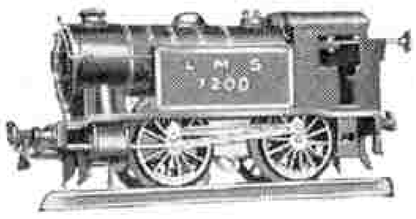
*No. 1 Clockwork Tank Locomotive
Reversing ... Price **11/6**

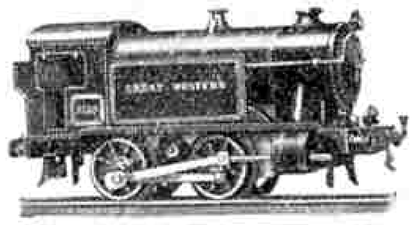




*EM320 (20-volt) or EM36 (6-volt) Electric Tank Locomotive
Reversing ... Price **16/6**

*No. 1 Special Clockwork Tank Locomotive
Reversing ... Price **15/9**



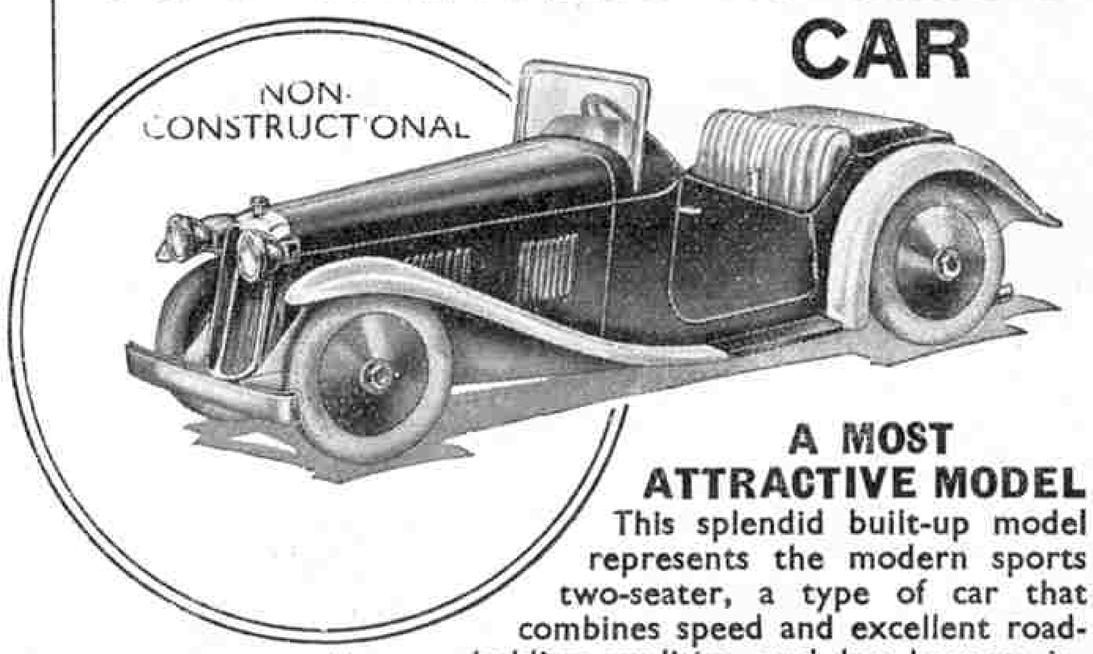


*EPM16 Special Electric Tank Locomotive
(6-volt Permanent Magnet Type) Reversing. Can be run from a 6-volt accumulator, or from A.C. mains through a Transformer-Rectifier ... Price **33/6**

Lettered and coloured to represent L.M.S., G.W.R., L.N.E.R., and S.R. Locomotives.

MECCANO LTD. BINNS ROAD LIVERPOOL 13

A REALISTIC
TWO-SEATER SPORTS CAR



The model is beautifully made and finished, and is richly enamelled in Blue and Cream

A MOST ATTRACTIVE MODEL

This splendid built-up model represents the modern sports two-seater, a type of car that combines speed and excellent road-holding qualities, and has become increasingly popular during recent years. Speed is suggested by the sweeping lines of the bodywork and mudguards, together with the sloping radiator and wind-screen.

The model faithfully resembles its prototype in all important respects. It is complete in itself, no constructional or assembly work being required. It steers from the wheel. and is fitted with a strong clockwork motor that gives a long and steady run.

Overall dimensions: Length, 8½ in.; Width, 3¼ in.; Depth, 2⅞ in.

Price 4/11

Manufactured by
Meccano Ltd., Binns Rd., Liverpool 13

MECCANO
PARTS & ACCESSORIES

REAL ENGINEERING PARTS IN MINIATURE

Meccano parts, many of which are here illustrated, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list.

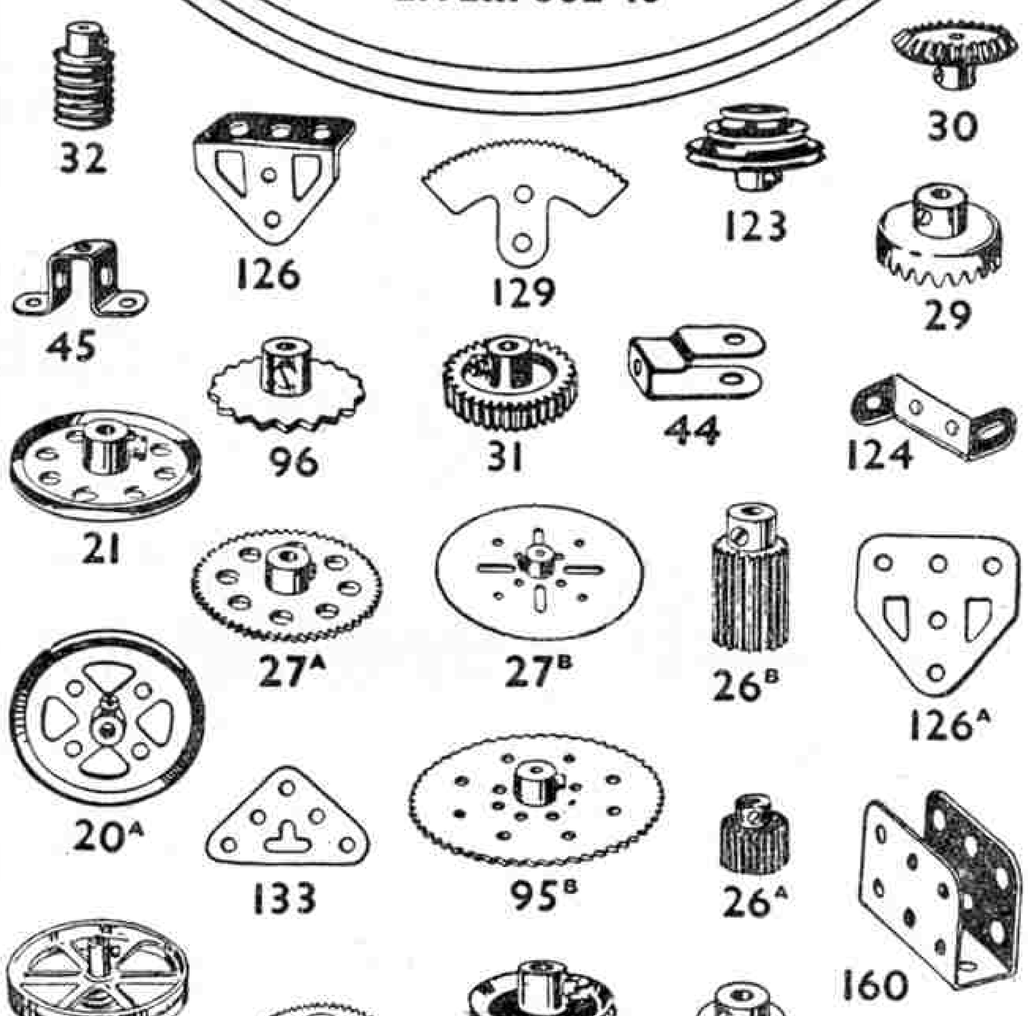
MECCANO LTD., Binns Road
LIVERPOOL 13

PRICES OF PARTS ILLUSTRATED

No.			s.	d.
3.	Perforated Strips, 3½"	½ doz.	0	4
9b.	Angle Girders, 3½"	„	0	7
10.	Flat Brackets	doz.	0	1
11.	Double Brackets	„	0	3
12a.	Angle Brackets, 1" x 1"	„	0	6
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1½" diam.	„	0	3
20b.	„ „ ¾" „	„	0	2
	Pulley Wheels			
19c.	6" dia. with centre boss and set screw	„	1	9
20a.	2" „ „ „	„	0	3
21.	1½" „ „ „	„	0	2½
22.	1" „ „ „	„	0	1½
23a.	½" dia. with centre boss and grub screw	„	0	2
22a.	1" dia. without centre boss and grub screw	„	0	1
23.	½" „ „ „	„	0	1
24.	Bush Wheels	„	0	2
26.	Pinion Wheels, ½" dia., ½" face	„	0	3
26a.	„ „ ½" „ ½" „	„	0	4
26b.	„ „ ½" „ ¾" „	„	0	5
	Gear Wheels			
27.	50 teeth to gear with ¾" Pinion	„	0	4
27a.	57 „ „ „ ½" „	„	0	5
27b.	133 „ „ „ ½" „	„	1	3
28.	Contrate Wheels, 1½" diam.	„	0	6
29.	„ „ ¾" „	„	0	4
30.	Bevel Gears, ⅝", 26 teeth	„	0	6
31.	Gear Wheels, 1", 38 teeth	„	0	8
32.	Worms	„	0	3
44.	Cranked Bent Strips	„	0	1
45.	Double „ „	„	0	1
46.	„ Angle Strips, 2½" x 1"	½ doz.	0	6
55.	Perforated Strips, slotted, 5½" long	each	0	1
77.	Triangular Plates, 1"	„	0	1
90.	2½" Curved Strips, 2⅝" radius	„	0	1
90a.	2½" Curved Strips, cranked, 1¾" radius, 4 to circle	„	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.			s.	d.
95b.	Sprocket Wheels, 56 teeth, 3" diam.	each	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam.	„	0	3
102.	Single Bent Strips	„	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	7
108.	Architraves	doz.	1	6
110.	Rack Strips, 3½"	each	0	2
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½"	„	1	0
123.	Cone Pulley	„	1	0
124.	Reversed Angle Brackets, 1"	½ doz.	0	4
125.	„ „ „ ½"	„	0	2
126.	Trunnions	each	0	1½
126a.	Flat Trunnions	„	0	1
129.	Rack Segments, 3" diam.	„	0	5
132.	Flywheels, 2¼" diam.	„	2	0
133.	Corner Brackets, 1½"	„	0	1
133a.	„ „ 1"	„	0	1
137.	Wheel Flanges	„	0	2
139.	Flanged Brackets (right)	„	0	2
145.	Circular Strips, 7½" diam. overall	„	0	10
147.	Pawls, with Pivot Bolt and Nuts	„	0	3
148.	Ratchet Wheels	„	0	4
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	3
154b.	Corner Angle Brackets, ½", left hand	„	0	3
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½"x1"x½"	„	0	2
161.	Girder Brackets, 2"x1"x½"	„	0	1½
167.	Geared Roller Bearings	„	20	0
168.	Ball Bearings, 4" diam.	„	3	0
170.	Eccentrics, ¼" throw	„	0	9
180.	Toothed Gear Ring, 3½ diam. {133 external teeth / 95 internal}	„	1	0
197.	Strip Plates, 12½"x2½"	„	0	5
200.	Curved Plates, 1 11/16" radius	„	0	1
211a.	Helical Gears, ½" (Can only be used together)	„	0	9
211b.	„ „ 1½" (Can only be used together)	„	2	0
216.	Cylinders, 2½"	„	0	3



PERFECT SCALE MODELS

DINKY TOYS

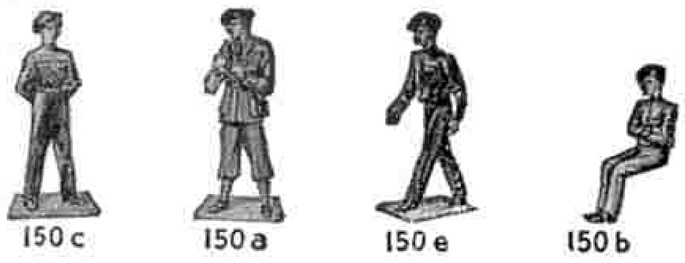
OVER 250 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes.

This year, in addition to reducing the prices of many of the existing models and sets, we have introduced several new items, including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

ROYAL TANK CORPS PERSONNEL

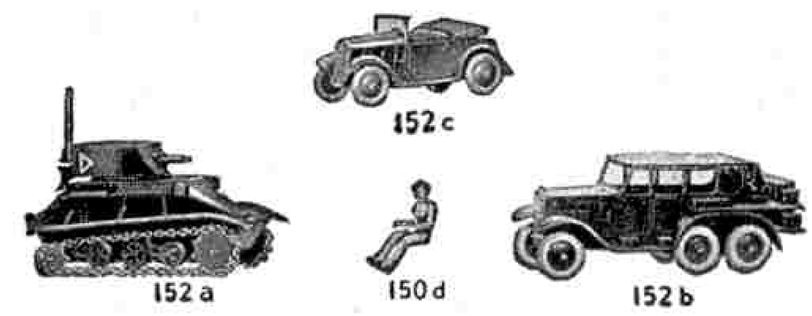


Dinky Toys No. 150

No. 150a Officer ... ... each **3d.**
No. 150b Private in sitting position (2) ... „ **3d.**
No. 150c Private in standing position (2) ... „ **3d.**
No. 150e N.C.O. ... ... „ **3d.**
Price of complete set **1'6**

Dinky Toys Nos. 150b, 150c, 150d and 150e can each be purchased in boxes containing one dozen at the special price of **2'9** per box.

ROYAL TANK CORPS LIGHT TANK SET



Dinky Toys No. 152

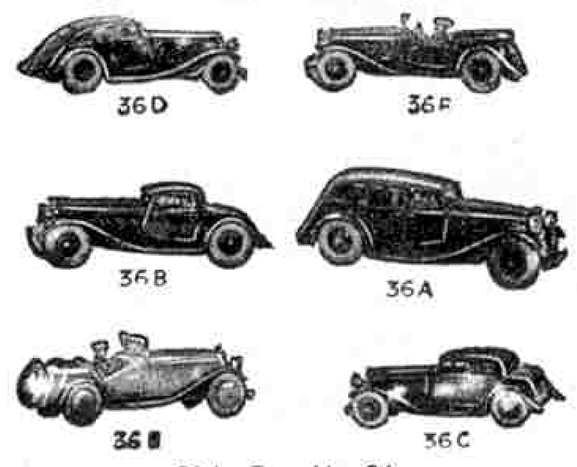
No. 152a Light Tank (4½ tons, 25 h.p.) ... ... each **1'1**
No. 152b Reconnaissance Car „ **1'-**
No. 152c Austin Seven Car „ **4d.**
No. 150d Driver ... ... „ **3d.**
Price of complete set **2'9**

AUSTIN SEVEN CAR

Dinky Toys No. 35d

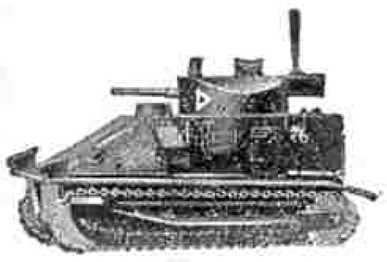
This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

MOTOR CARS
WITH DRIVERS, PASSENGERS, ETC.



Dinky Toys No. 36
Fitted with detachable rubber tyres. Silver-plated radiators.

with driver and footman ... each **11d.**
No. 36a Armstrong Siddeley (Limousine)
No. 36b Bentley (Two-seater Sports Coupe) with driver and passenger ... „ **11d.**
No. 36c Humber (Vogue Saloon) with driver and footman ... ... „ **11d.**
No. 36d Rover (Streamline Saloon) with driver and passenger... ... „ **11d.**
No. 36e British Salmson (Two-seater Sports) with driver ... ... „ **11d.**
No. 36f British Salmson (Four-seater Sports) with driver ... ... „ **11d.**
Price of complete set **5/6**

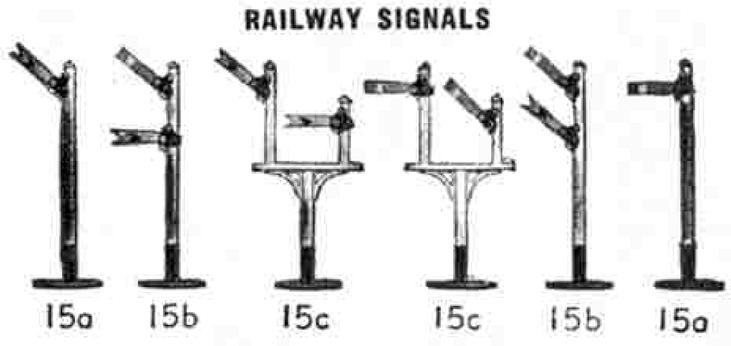


ROYAL TANK CORPS MEDIUM TANK SET

Dinky Toys No. 151

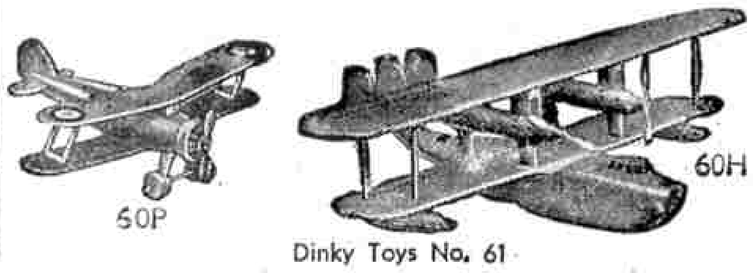
No. 151a Medium Tank (12 tons, 90 h.p.) ... ... each **1'6**
No. 151b Three-ton Transport Wagon ... ... „ **1'-**
No. 151c Cooker Trailer with jack stand ... ... each **7d.**
No. 151d Water Tank Trailer ... „ **5d.**
No. 150d Driver ... ... „ **3d.**
Price of complete set **3'9**

RAILWAY SIGNALS



Dinky Toys No. 15
No. 15a Single Arm Signals ("Home" and "Distant") each **2d.**
No. 15b Double Arm Signals (2) ... ... „ **3d.**
No. 15c Junction Signals ("Home" and "Distant") „ **4d.**
Price of complete set **1/6**

R.A.F. AEROPLANES



Dinky Toys No. 61

No. 60h "Singapore" Flying Boat ... ... each **1/-**
No. 60n Fairey "Battle" Bomber (2)... ... ... „ **4½d.**
No. 60p Gloster "Gladiator" Biplane (2) ... ... „ **6d.**
Price of complete set **2/9**

EMPIRE FLYING BOATS

Dinky Toys No. 60r

Scale models of the latest Imperial Airways Flying Boats. Twelve models available named: *"Caledonia," "Canopus," "Corsair," "Challenger," "Centurion," "Cambria," "Calpurnia," "Ceres," "Clio," "Calypso," "Corinna"* and *"Cheviot."* Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No. 60x

Similar in type to the Empire Flying Boat. Assorted colours. Price **1/-** each.

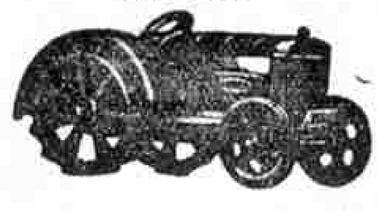
ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v

Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

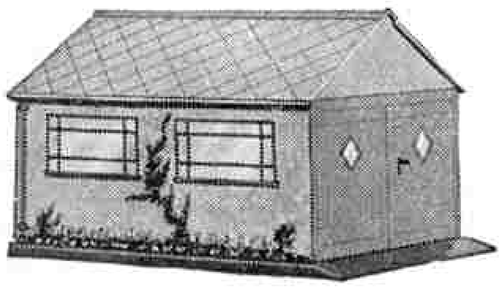
Ask your dealer to show you the complete range of Dinky Toys.

TRACTOR



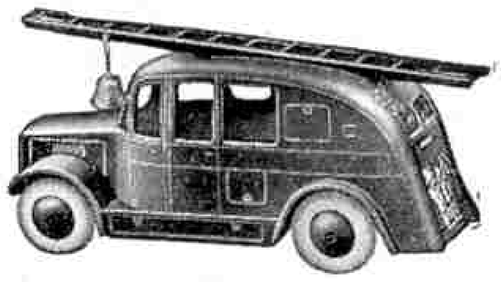
Dinky Toys No. 22e
Price **9d.** each

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars. Price **1/3** each

STREAMLINE FIRE-ENGINE



Dinky Toys No. 25k
Finished in red.
Fitted with six firemen, bell, ladder and detachable rubber tyres. Price **1/-**

POLICE MOTOR CYCLIST
Dinky Toys No. 37b

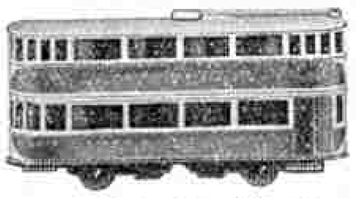
Price **6d.** each

CIVILIAN MOTOR CYCLIST
Dinky Toys No 37a

Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Rubber tyres. Price **6d.** each

TRAM CAR

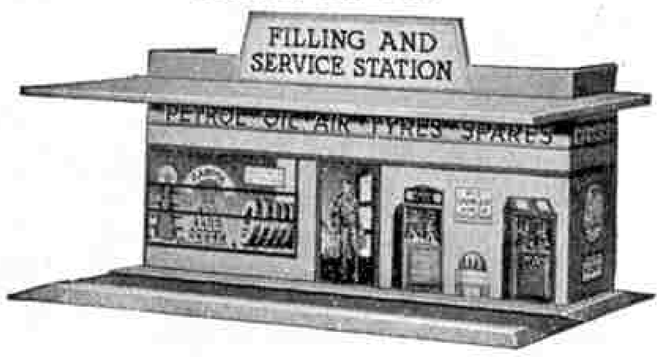


Dinky Toys No. 27
Assorted colours.
Price **3d.** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

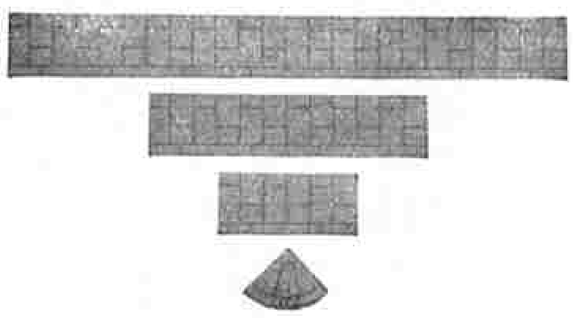
A FASCINATING COLLECTING HOBBY — DINKY TOYS — FINISHED IN RICH COLOURS

PETROL STATION



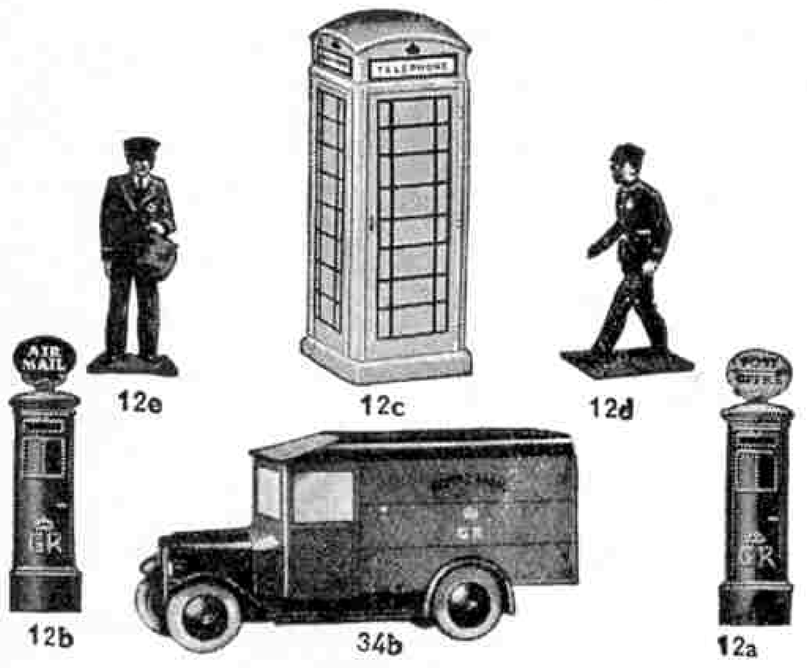
Dinky Toys No. 48
Accurate reproduction of a filling station.
Price **1/3** each

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners. Price of complete set **6d.**

POSTAL SET

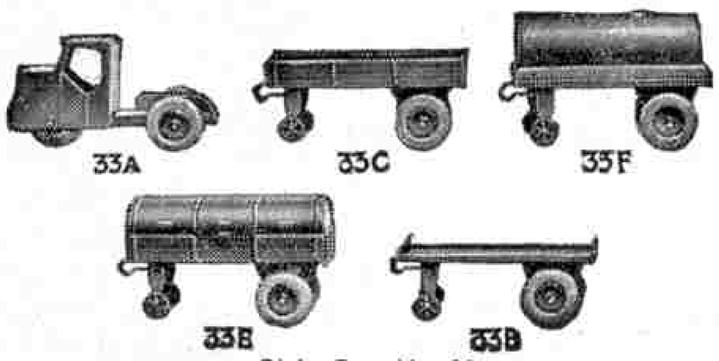


Dinky Toys No. 12

No. 12a	Pillar Box, G.P.O.	each **3d.**
No. 12b	" " Air Mail	" **3d.**
No. 12c	Telephone Call Box	" **4d.**
No. 12d	Telegraph Messenger	" **3d.**
No. 12e	Postman	" **3d.**
No. 34b	Royal Mail Van	" **10d.**

Price of complete set **2/3**

MECHANICAL HORSE AND FOUR ASSORTED TRAILERS

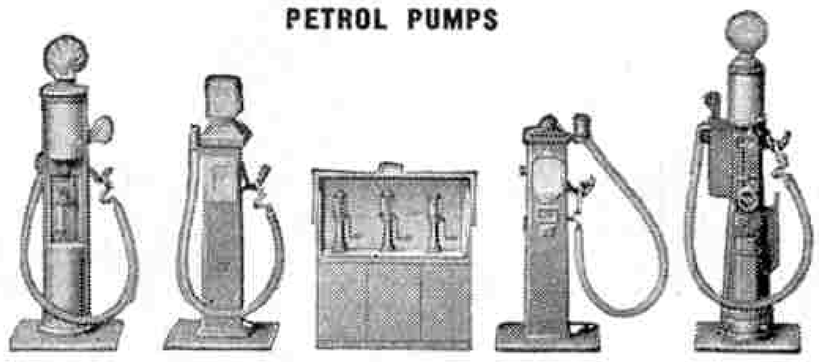


Dinky Toys No. 33
Fitted with detachable rubber tyres.

No. 33a	Mechanical Horse	each **6d.**
No. 33b	Flat Truck	" **6d.**
No. 33c	Open Wagon	" **6d.**
No. 33e	Dust Wagon	" **8d.**
No. 33f	Petrol Tank	" **8d.**

Price of complete set **2/9**

PETROL PUMPS

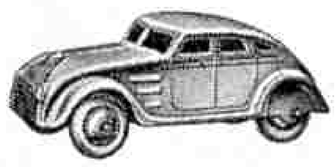


Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Finished in correct colours.

No. 49a	Bowser Pump	each **3d.**
No. 49b	Wayne Pump	" **3d.**
No. 49c	Theo Pump	" **3d.**
No. 49d	Shell Pump	" **3d.**
No. 49e	Oil Bin (Pratts)	" **3d.**

Price of complete set **1/3**

STREAMLINE SALOON



Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

STREAMLINE TOURER

Dinky Toys No. 22g
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

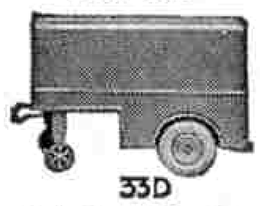
D.H. "COMET" AEROPLANE

Dinky Toys No. 60g
Scale model of the aeroplane used by Flying Officer A. E. Clouston and Mrs. Kirby-Greene in their record flight to Capetown and back. Price **6d.** each

MOTOR TRUCK

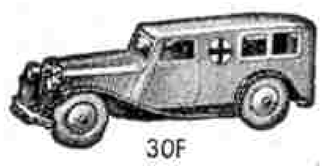
Dinky Toys No. 22c
Assorted colours Fitted with detachable rubber tyres.
Price **6d.** each

BOX VAN



Dinky Toys No. 33d
Fitted with detachable tyres.
Price **8d.** each

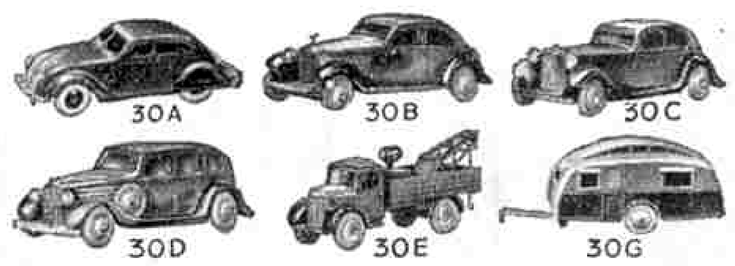
AMBULANCE



30F

Dinky Toys No. 30f
Fitted with detachable rubber tyres. Finished in grey, with red cross. Silver-plated radiator. Price **6d.** each

MOTOR VEHICLES



Dtnky Toys No. 30
Fitted with detachable rubber tyres. Silver-plated radiators.

No. 30a	Chrysler "Airflow" Saloon	each **6d.**
No. 30b	Rolls-Royce	" **9d.**
No. 30c	Daimler	" **9d.**
No. 30d	Vauxhall	" **9d.**
No. 30e	Breakdown Car	" **9d.**
No. 30g	Caravan Trailer	" **6d.**

Price of complete set **3/11**

SMALL CARS

Dinky Toys No. 35 — Fitted with rubber tyres

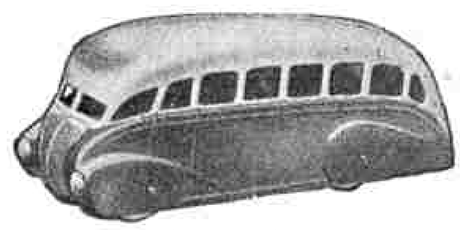
No. 35a	Saloon Car	each **3d.**
No. 35b	Racer	each **3d.**
No. 35c	"M.G." Sports Car	" **3d.**

Price of complete set **9d.**

BEACON

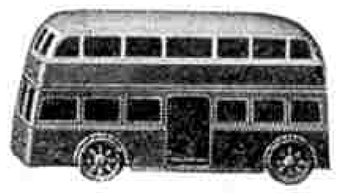
Dinky Toys No. 47d
Realistic model of the Belisha Safety Beacon.
Price **1d.** each

STREAMLINE BUS



Dinky Toys No. 29b
Fitted with rubber tyres.
Price **6d.** each

MOTOR BUS

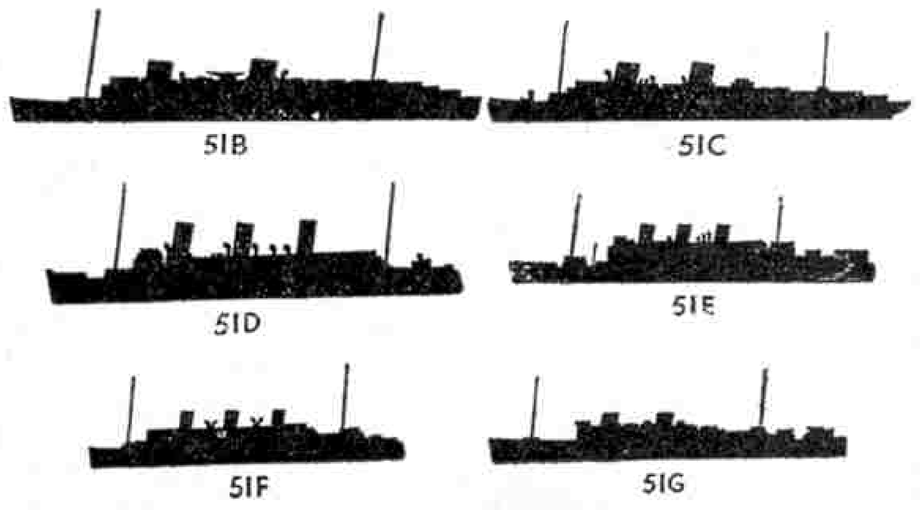


Dinky Toys No. 29a
Assorted colours.
Price **4d.** each

ROBOT TRAFFIC SIGNAL

Dinky Toys No. 47a
(Four face)
Price **3d.** each
No. 47b (Three face)
Price **3d.** each
No. 47c (Two face)
Right-angle or back-to-back. Price **3d.** each

FAMOUS LINERS



Dinky Toys No. 51

No. 51b	"Europa"	each **6d.**
No. 51c	"Rex"	" **6d.**
No. 51d	"Empress of Britain"	" **6d.**
No. 51e	"Strathaird"	" **6d.**
No. 51f	"Queen of Bermuda"	" **6d.**
No. 51g	"Britannic"	" **6d.**

Price of complete set **2/11**

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

OF IMITATIONS!

All good products are copied. It is the penalty of being the best.

Seccotine which was first made in 1884, has been copied over and over again. But the Seccotine formula —known only to Seccotine—remains unchanged— the BEST.

Repeated tests have shown conclusively that no other adhesive in the world to-day is as permanently strong as Seccotine. Use it with reliance and confidence for all your making or mending jobs. Seccotine joins all surfaces—metal, wood, glass, etc., TO LAST and TO LAST FOR GOOD. Sold everywhere in pin-stopper tubes complete with directions for use. 4½d., 6d., and 9d.

SECCOTINE REGD.

The Double Strength ADHESIVE

POST THIS COUPON to Dept. M

M'CAW, STEVENSON & ORR LTD., BELFAST

I should like to have, post free, copies of your Free Booklets which describe the many uses for Seccotine.

Name .....

Address .....

A REAL TYPEWRITER

THE NEW SIMPLEX TYPEWRITER really does produce beautifully typed letters, invitation cards, programmes, etc., with utmost ease. It is undoubtedly the best machine of its kind ever made, and one any boy would be proud to possess.

Specimens of characters:

A B C D E F . , 1 2 3 4 5 6

Model 100 5/-; R 6/6; S 10/6
T 21/- (68 large and small characters)

Guaranteed for 2 Years

The improved TOY TYPEWRITER with sliding carriage

Prints 36 Characters on paper or card 6" wide, any length. Alphabet and numerals.

MODEL R, each 6/6

FROM ALL TOY DEALERS

Write for list "C" to

SIMPLEX TYPEWRITER Co. 1, NEWMAN STREET, LONDON, W.1.

Models in the SCIENCE MUSEUM

can be studied at home in a fine series of Handbooks

SHIPS

Fully illustrated descriptive accounts of ships of all kinds based on the models in the Museum are contained in: SAILING SHIPS, Part I. Historical Survey, 3s. (3s. 3d.). Part II. Descriptive Catalogue of the models on view, with dimensions, etc., 2s. 6d. (2s. 9d.). BRITISH FISHING BOATS AND COASTAL CRAFT. A record of disappearing types, 2s. (2s. 2d.). MERCHANT STEAMERS, 1s. 3d. (1s. 5d.). STEAM SHIPS OF WAR, 1s. (1s. 2d.). MARINE ENGINES, History and Development, 2s. (2s. 2d.).

AEROPLANES AND AIRSHIPS

These are similar Handbooks on HEAVIER-THAN-AIR-CRAFT (Aeroplanes), 2s. 6d. (2s. 9d.). LIGHTER-THAN-AIR-CRAFT (Airships and Balloons), 2s. 6d. (2s. 9d.). THE PROPULSION OF AIR CRAFT (Aeroplane Engines, etc.), 2s. (2s. 3d.). A fascinating account of man's effort to fly and final mastery of the air is given in AN INTERPRETIVE HISTORY OF FLIGHT, 5s. (5s. 6d.).

All prices are net. Those in brackets include postage.

HIS MAJESTY'S STATIONERY OFFICE

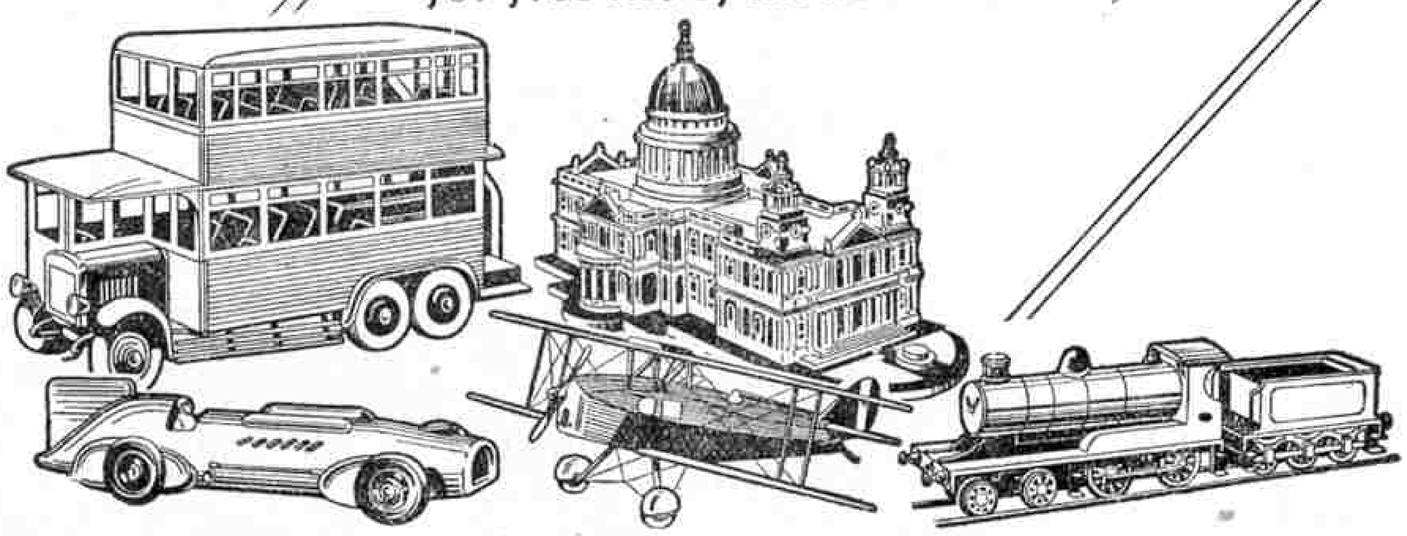
LONDON: Adastral House, Kingsway, W.C.2.
EDINBURGH 2: 120, George St.; MANCHESTER 1: 26, York St.; CARDIFF: 1, St. Andrew's Crescent; BELFAST: 80, Chichester St.; or through any bookseller.

MODELS
CABINETS
FURNITURE
CLOCKS
TRAYS
TOYS
GALLEONS

Make them all with a HOBBIES FRETWORK SET

All kinds of realistic models and work cut in wood for exhibition or as suitable gifts. Complete full size charts, instructions and all materials supplied by Hobbies. Easily made with a few fretwork tools. A fascinating pastime for the boy who likes to use real tools. Simple, inexpensive and interesting. Write for free list of models to make, etc.

SAWS
WOOD
DESIGNS
WHEELS
FITTINGS
DOLLS' PAPER



In the 1938 Handbook are 284 pages of interesting articles with special chapters on making galleons, and a large 2/- design chart for a model Country Inn free. No other book like it. A thousand things to make and do. Only 6d. from any newsagent or sent post free for 9d. from Dereham. Free illustrated leaflets on request.

GET THE HOBBIES
1938 HANDBOOK

Tools, materials, etc., from leading ironmongers, or Hobbies own branches in London, Glasgow, etc., or by post: Hobbies Ltd. (Dept. 96), Dereham, Norfolk.

SKYBIRDS

The original and the most popular 1/72nd scale model
CONSTRUCTIONAL AEROPLANES

• ENTIRELY BRITISH PRODUCTION •

Perfect replicas of their prototypes

There are over 10,000 SKYBIRD MODELLERS registered in the SKYBIRD LEAGUE and a still greater number who enjoy SKYBIRD MODELLING. If you are interested write for FREE Illustrated Leaflet and Price List:

"SKYBIRDS" (Desk B),
3, Aldermanbury Avenue, London, E.C.2.

"That you, Sam...?

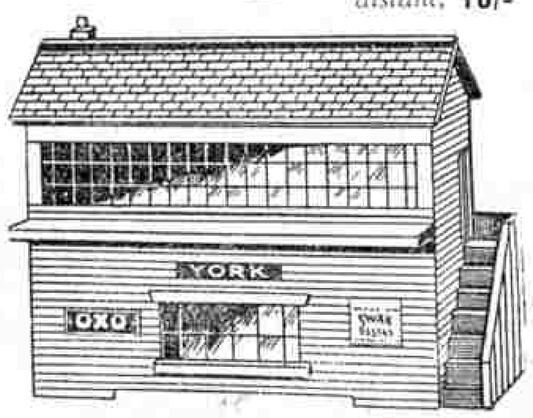
Can you accept the 9-15 down express?"

"O.K. . . . mustn't forget the 9-17 goods."

6 LEVER FRAME. 7/6 *(left)*

SIGNAL CABINS *(below)* **5/7,** *9" long, price* **5/9**

UPPER QUADRANT SIGNALS *2 arm Bracket Signal, home or distant,* **10/-**



AN efficient rail organization depends upon men like Signalman Sam (a keen, spare-time model railway enthusiast), backed up by absolutely reliable equipment. As Chief Signalman, are you certain you can rely on **your** equipment, or do you have difficulty with your system of controls? If so, drop a line to ★Bert Mills—he'll save you no end of expensive mistakes.

P.S. Send 6d. for a first-rate catalogue when you're writing.

★*Bert Mills, one of the "Big 3" behind* **Milbro!** *Has made a lifelong study of model railway problems.*

MILBRO *TRUE-TO-SCALE models for reliability*

MILLS BROS. (Model Engineers) LTD. (Dept. F.S.), St. Mary's Rd., SHEFFIELD

MARVELLOUS VALUE! THIS REAL

MICROSCOPE

COSTS YOU ONLY **2'6** Post Free

Larger Model 5/-

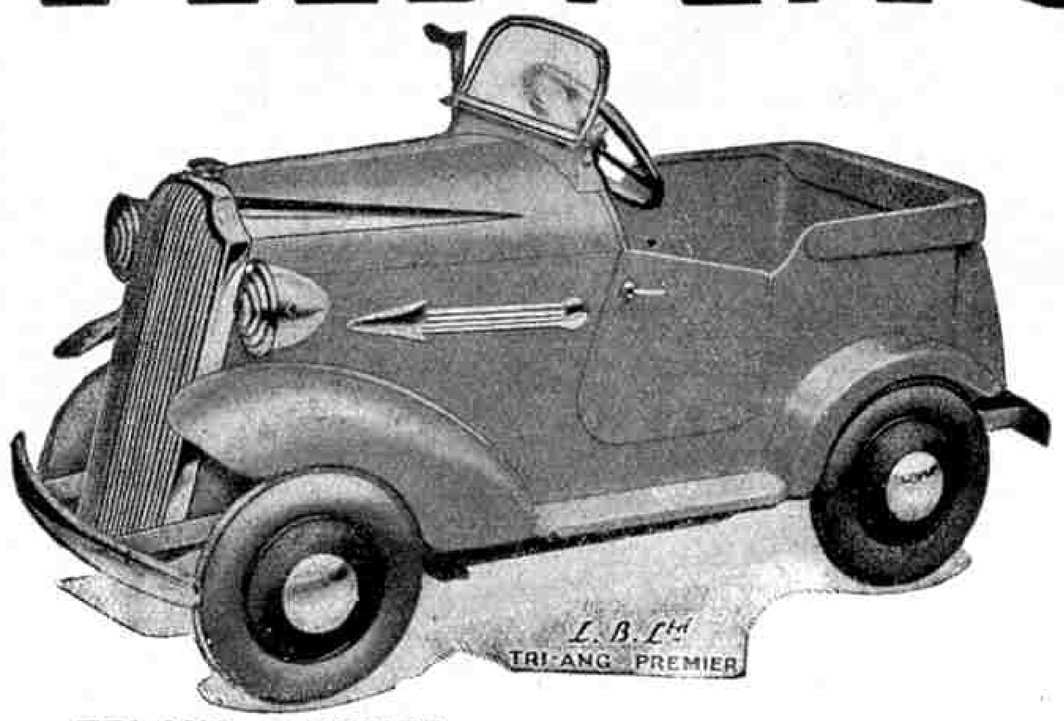
Brings before your eyes the amazing detail of insect life, fingerprints, marks on foreign stamps, etc., etc. This sturdily-built little instrument is fitted with three focusing lenses, swivel mirror reflector, specimen and spare slides. You'll never get a better bargain!

Write for free list of many other inexpensive novelties we can supply.

Send your P.O. to-day to

STOREY & CO.
NEW BRIGHTON, WALLASEY

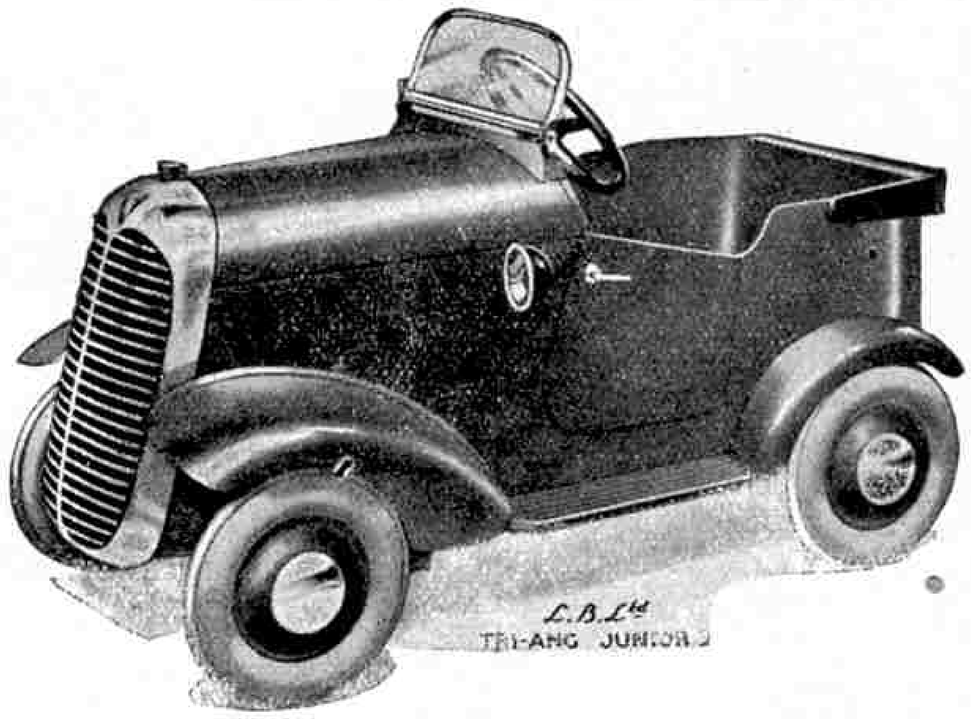
TRI-ANG



TRI-ANG PREMIER

Super Children's Car. All-steel body. Latest type Vauxhall radiator, lamps and bumpers. 8 in. balloon disc wheels. ¾ in. rubber tyres. BALL-BEARING BACK AXLE. Windscreen and direction indicator. Dummy hood. All bright parts CHROMIUM-PLATED. Length 39 in

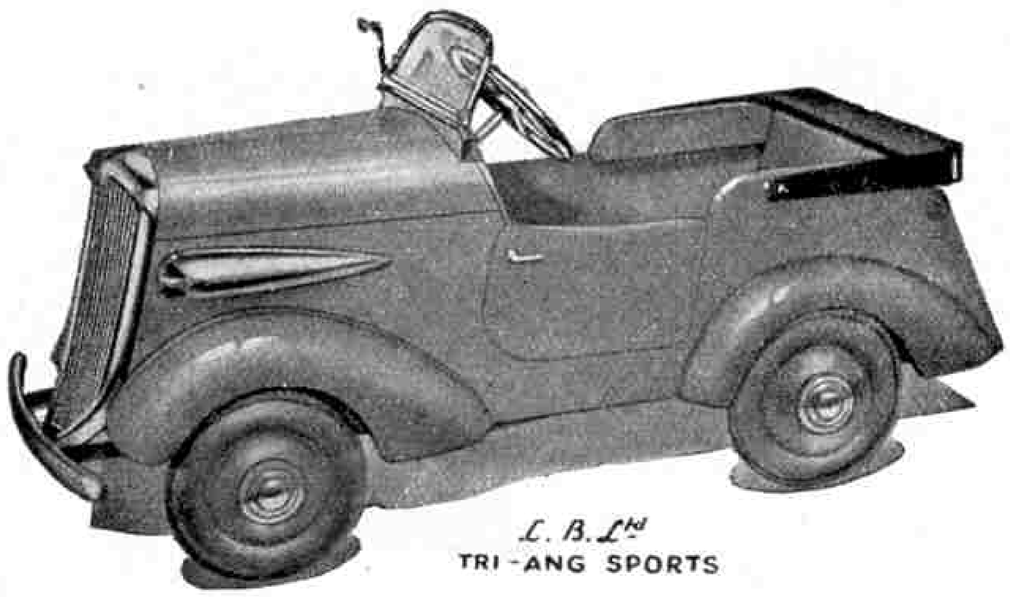
Price 45/-



TRI-ANG JUNIOR

Realistic Sports Car. All steel body. Opening side door. Plated streamline radiator. Two dummy side lamps. 8 in. balloon disc wheels. ¾ in. rubber tyres. Equipment includes petrol and oil cans. Length 34 in.

Price 29/6



TRI-ANG SPORTS

Realistic streamlined model, with opening side door and luggage boot. 8 in. balloon disc wheels. ¾ in. rubber tyres. Ball-bearing back axle. Plated bumper and streamline dummy side lamps. Windscreen, direction indicator and dummy hood. Length 41 in.

Price 42/-

"UNITY" BOY'S CYCLE No. 18 PB

18 in. frame. Finest quality British tube. Wheels 18 in. x 1⅜ in. CHROMIUM-PLATED rims. Dunlop pneumatic tyres. Roller lever pattern brakes. Three-coil saddle. ½ in. x ⅛ in. roller chain. Ball-bearings throughout. Complete with equipment and finished in black or blue. All usual bright parts CHROMIUM-PLATED. Ages 7 to 11.

Price 67/6

TRI-ANG "FAIRYCYCLE" (Regd.) MODEL No. 2

Tubular frame. 14 in. wheels. 1¾ in. grey imitation pneumatic tyres. Ball-bearing pedals. Rim brake. Two-coil saddle. Chain cover. Stand. CHROMIUM-PLATED FITTINGS. Black, blue or maroon.

Price 42/-

TRI-ANG TRICYCLE No. 5 (Regd. Trade Mark)

NOW FITTED WITH BALL-BEARINGS THROUGHOUT AND ROLLER BRAKE

Cycle chain drive with free-wheel. Frame best quality weldless cycle tubing. 14 in wheels. 1¾ in. jointless sponge-rubber tyres. Improved handlebars. Rim brake. Coil spring saddle. CHROMIUM-PLATED FITTINGS. Black, blue or maroon.

Price 63/-

ASK YOUR DEALER FOR THE TRI-ANG TOY COLOURED LEAFLET

L. BROS. LTD. LONDON BROS ENGLAND

LINES BROS. LTD., Tri-ang Works
Morden Rd., Merton, London, S.W.19

NEXT MONTH: "THE MACHINERY OF A SAWMILL." PUBLISHING DATE: 1st FEBRUARY

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIII. No. 1
January, 1938

With the Editor

British Records in 1937

During 1937 there were many stirring events on the road, on the railway and in the air, and splendid new British records were set up. Some of these were also world records, and left no doubt that Great Britain is well to the forefront in matters of this kind. Thus Sir Malcolm Campbell, who achieved world-wide fame as a speed record-breaker on land, turned his attention to motor boats, and in his *"Bluebird"* attained 129.50 m.p.h. on Lake Maggiore. This was more than 5 m.p.h. in excess of the previous world record, held by the American Commodore Gar Wood.

Curiously enough, Sir Malcolm lost his land speed record soon after gaining the world's speed record on water. His successor is Captain Eyston, another Briton who previously had been concerned chiefly with long-distance records. In his car *"Thunderbolt,"* the two Rolls-Royce engines of which develop a total of 4,700 h.p., Captain Eyston covered a measured kilometre on the salt flats of Bonneville, in the United States, at an average speed of 312.0 m.p.h., beating Sir Malcolm Campbell's record by the handsome margin of 10 m.p.h.

The Editor
and all his staff wish every reader
a very
Happy New Year

Flying Ten Miles High

Records on land and water have been rivalled by records in the air. Of these the most outstanding was that of Flight-Lieut. M. J. Adam, who on 30th June reached a height of 53,937 ft., or more than 10 miles. The flight was a triumph of organisation. In it Flight-Lieut. Adam went nearly a mile higher than any other pilot has climbed in an aeroplane. An article giving full details of this record achievement will appear in next month's *"M.M."*

Other great British records in the air were achieved over the now famous routes between England and Australia and England and South Africa, which continue to attract adventurous pilots. In May Mr. H. F. Broadbent flew solo from Australia to England in 6 days 8 hrs. 25 min., but this record was well beaten in October by Miss Jean Batten, whose time for the journey was 5 days 18 hrs. 15 min. The greatest feat of long-distance flying of the year, however, was that of Flying-Officer Clouston and Mrs. Kirby-Green, who flew from England to Capetown and back again within six days, although they remained in Capetown for an engine overhaul for more than two days. The outward flight occupied only 1 day 21 hrs. 2 min. and the return was made in 2 days 9 hrs. 23 min. The full story of this magnificent achievement is told on page 7 of this issue.

Another air record promising well for the future of British flying is that for the crossing of the Atlantic Ocean between Ireland and Newfoundland. Experimental flights in preparation for the regular mail and passenger service were made by the Imperial Airways flying boats *"Caledonia"* and *"Cambria,"* in association with the Pan-American Airways *"Clipper III."* During these flights the *"Cambria"* crossed from west to east in 10 hrs. 33 min., and previously had made a record for the westward crossing by flying from the base at Foynes, Ireland, to that in Newfoundland in 14 hrs. 24 min.

High Speeds on Railways

On the railways the past year has been one of speeding-up and streamlining. The greatest speed achievement was the attaining by L.M.S. No. 6220 *"Coronation"* of 114 m.p.h. during a trial run from Euston to Crewe. This engine is of a streamline type introduced for *"The Coronation Scot,"* the new high-speed service of the L.M.S. between London and Glasgow.

The L.N.E.R. have created a new record by the introduction of the six-hour *"Coronation"* service between London and Edinburgh. This train is hauled by special streamline "Pacific" engines, and its average speed of 71.9 m.p.h. from London to York makes it the fastest train in the British Empire.

"Carborundum" Crucibles

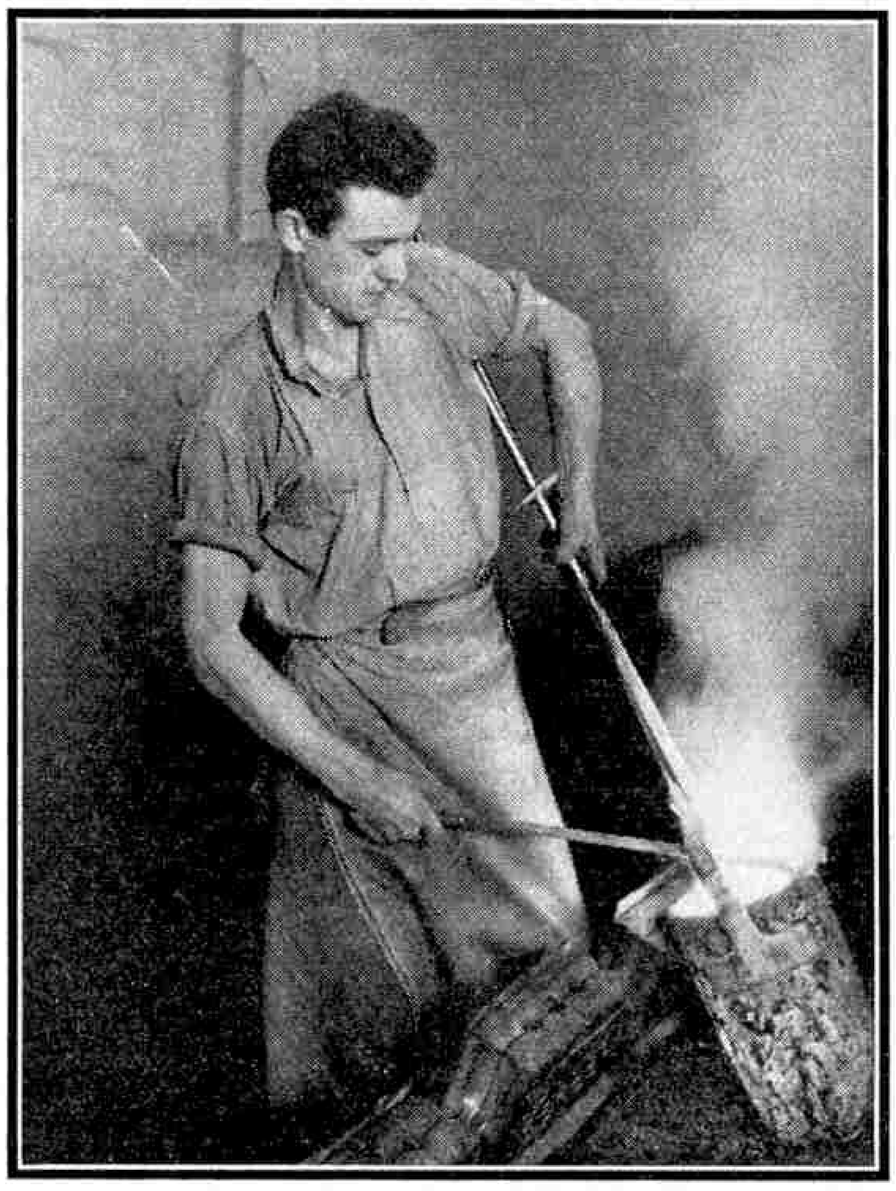
The Melting and Pouring of Metals

ONE of the outstanding features of the development of the human race has been the increasing use that has been made of metals, which to-day has reached such a pitch that life in a world devoid of metals is quite unthinkable. If we try to imagine a state in which there are no aeroplanes, railways, cycles, or motor cars, no telegraphs or telephones or radio sets, and no water, gas, or electricity services, we can realise a little of the tremendous influence the use of metals has exerted upon our everyday lives. It is indeed difficult to think of anything we do during the course of a day that does not involve the use of metals, from the time we use our metal knife and fork for eating our breakfast until we fall asleep in our comfortable metal framed bed.

The shaping of metals into useful articles by melting and pouring into suitably shaped moulds has been practised for at least 4,000 years. It is only a little over 100 years ago, however, that the modern type of crucible for containing the metal was introduced. At that time a big step forward was made by introducing plumbago or graphite into the composition from which the crucibles were made. This material is familiar in the form of "black lead" in pencils, but the quality suitable for use in crucibles occurs in flat flakes, and is obtained chiefly from Ceylon and Madagascar. These flakes can slide over one another very readily. Thus they provide flexibility, and so make the crucibles much more resistant to cracking from the sudden expansions and contractions that they undergo when put into and taken out of hot furnaces.

Graphite also has the property of transferring heat rapidly, and so reducing the time required to melt a given weight of metal. The clay crucibles previously used would only last for two or three meltings, but the new ones could be used 40 to 60 times.

The next big improvement came through the discovery in 1891 of *"Carborundum,"* or silicon carbide. This discovery was due to Dr. Acheson, an American chemist, who was endeavouring to make artificial diamonds in a laboratory electric arc furnace, when he noticed that small glistening crystals had formed on the end of the electrodes. He examined these and found that they were exceedingly hard and would cut glass. *"Carborundum"* indeed is the hardest substance known, with the one exception of the diamond, and for this reason is used largely in grinding operations in engineering works.



A caster pouring brass from a 60-lb. "Carborundum" crucible into sand moulds. The illustrations to this article are reproduced by courtesy of the Carborundum Company Ltd., Manchester.

This was the beginning of what is to-day a large industry, producing over 30,000 tons of *"Carborundum"* annually. The compound is made by heating a mixture of coke and sand, or silica, which provide the carbon and silicon required. This is done in an electric resistance furnace, in which a powerful current is passed through a carbon core, around which the mixture is placed. A single modern resistance furnace used for this purpose will produce 8 tons of carborundum in 36 hours, and to do this uses energy in the form of electric current to the extent of 3,000 h.p.

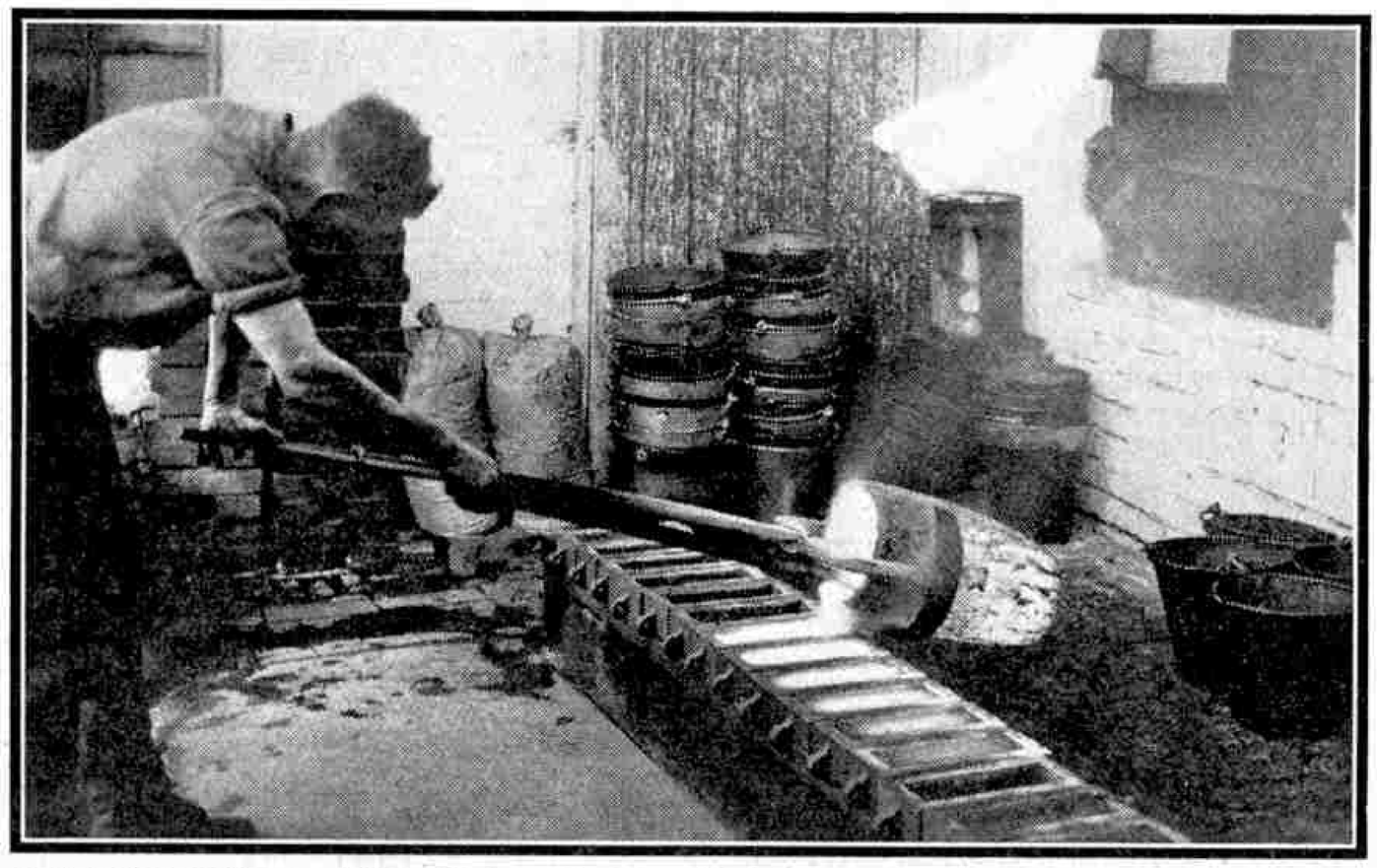
The temperature in such a furnace is estimated to be 4,000 deg. F. When the process is complete the furnace is allowed to cool, and the *"Carborundum"* formed is removed as a mass of crystals, which are crushed, acid-treated and washed before grading. The best grades are found near the core. The pure material crystallises in six-sided or hexagonal plates. It may be transparent and colourless, but varieties that are emerald green to black in colour are representative of the commercial product.

"Carborundum" was soon found to possess other valuable properties besides its hardness, which renders it pre-eminent as an abrasive. The fact that it is formed at the very high temperature of 4,000 deg. F. showed it to be extremely resistant to high temperatures, and its use in refractory bricks and furnace linings was a logical sequence. It also has a lower coefficient of expansion, and a much greater thermal conductivity, than the more commonly used refractory materials. These properties confer upon articles made from *"Carborundum"* great resistance to cracking through sudden temperature changes, as well as more rapid heating with a lower fuel consumption.

Obviously such a material is very suitable for the manufacture of crucibles, which are subjected to great thermal strains. They are placed in white hot furnaces and have cold metal put in them, followed by a period of heating to melt the metal, and then are withdrawn into the cold air of the foundry; finally the molten metal is poured out into the moulds, and its place in the crucible is taken by cold air.

Our cover illustration shows foundrymen lifting a *"Carborundum"* crucible of molten metal from a pit furnace, that is a furnace sunk into a "pit," with its top almost flush with the floor of the shop. This is done in order to facilitate the handling of the crucibles into and out of the furnace.

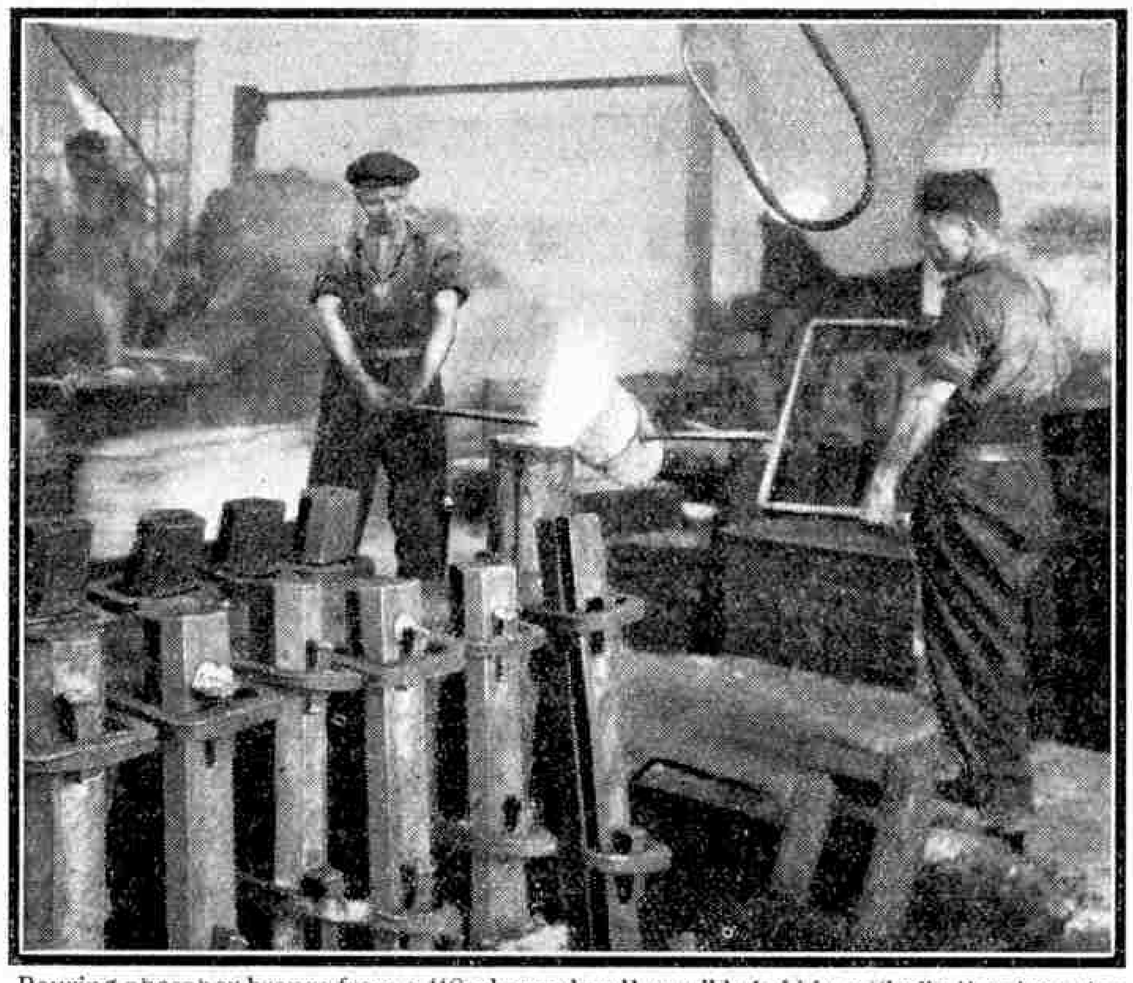
For the operation of removing the crucible of metal, the man holding the two vertical shanks of the tongs sets the latter in position on the crucible, making sure that the grip is low enough down for safety and yet not sufficiently low for the "reins," or inclined members of the tongs, to rest on the top edge of the crucible. If this occurs pieces may be broken out of the crucible when he tightens his grip for lifting. When the tongs are firmly and correctly adjusted in position, the two assistants insert a shaped bar into a hook that forms part of the tongs close to the fulcrum. By this means the crucible is lifted clear of the furnace, the first man steadying and guiding it during this movement by means of the tongs.



Molten gun metal from a 150-lb. "Carborundum" crucible being poured into ingot moulds. The caster pours the metal and at the same time holds back oxides and dross.

The crucible is placed on the floor in the ring of a "buile" and the tongs are removed. The "buile" consists of an iron ring with handles extending diametrically opposite from one another. One of these handles is a plain bar, similar to one end of the lifting bar seen on our cover, but the other has its end opened out to form a U-shaped double handle.

When the crucible has been placed on the floor in the ring of the buile, the latter is lifted until it fits in approximately the position previously occupied by the tongs. In the buile the crucible is then carried to the moulds into which the metal is poured. The man holding the double handle controls the pouring, the man at the other end simply taking his share of the weight. This is the object of the design of the buile, which is shown in use in the lower illustration on this page. The men wear gauntlets as protection from the heat.



Pouring phosphor bronze from a "Carborundum" crucible held in a "buile," or iron ring with handles. The operation is controlled by means of the double handle.

"Carborundum" crucibles are made in a variety of shapes to suit various designs of furnaces, and their sizes range from the small ones capable of containing only 1 lb. of copper to those that will hold over 1½ tons. With their development, crucible life has been increased from an average of 40 to 60 melts up to 120 to 180 melts for ordinary brass, while for some special metals almost 1,000 melts have been reached, and averages of 500 to 600 melts have been maintained over long periods.

As they do not absorb moisture from the air, *"Carborundum"* crucibles can be taken from the stock room and put straight into the hot furnaces without cracking or bursting. Plumbago crucibles have to be stored in a warm dry room, and heated up very gradually over a period of several hours before they are put on to production. Thus the introduction of the newer material has effected a saving in time and expense.

In order to make *"Carborundum"* crucibles universally applicable, special grades have been developed for use in melting different metals, and also for different fuels; and by specifying the metal and the fuel, the foundry man is sure to obtain the particular grade best suited to his work. A very wide variety of conditions is covered successfully by the range developed. For instance, the crucibles are used for the melting of aluminium and aluminium alloys, where the temperature is relatively low, since the melting point of aluminium is about 1,200 deg. F. Freedom from contamination is of great importance in view of the machining that has subsequently to be done, and the high specifications that have to be met in regard to the physical properties for such important parts as the pistons of aero and motor car engines.

Next in order of rising temperature comes the melting of copper and its usual alloys, brass and bronze. These may be grouped together as medium temperature applications, the melting point of copper being about 2,000 deg. F.

In this group also may be classed the melting of gold and silver, for both of which the *"Carborundum"* crucible has been found very suitable. Large numbers are exported to the gold mines of South Africa for the smelting of gold. For this operation they are not used singly in small pit furnaces such as are generally used in a brass foundry, but are packed 30 or 40 at a time on the hearth of a coal-fired reverberatory furnace. In this medium temperature group special grades of crucibles have been developed to give the best service to each user.

Finally, as examples of the high temperature group the melting of nickel and stainless steel may be mentioned. The temperatures range from 2,700 deg. F. to 3,100 deg. F., and several special grades of crucible are available.

For the information in this article we are indebted to the Carborundum Company Ltd.

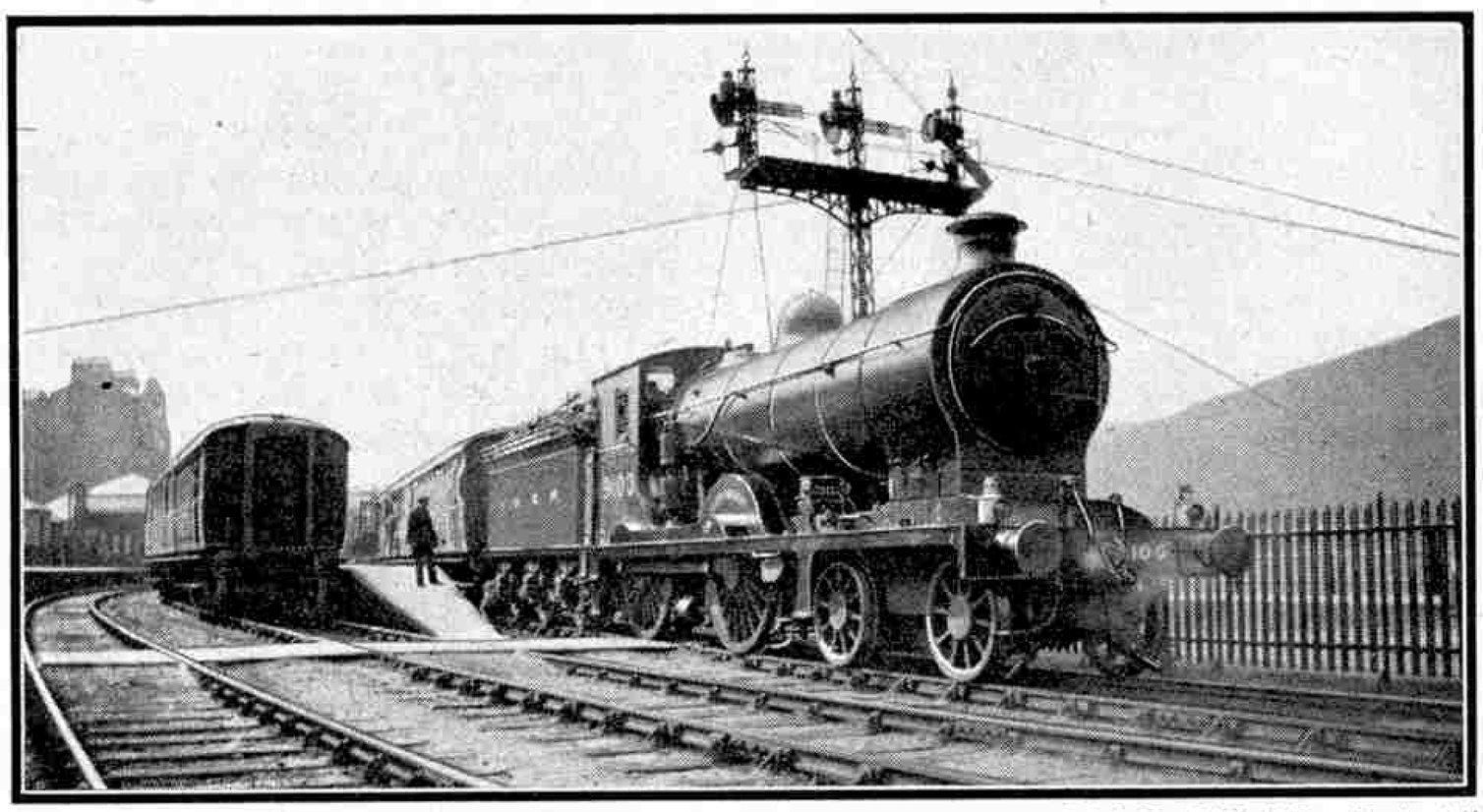
The Skye Boat Express

A Footplate Trip on the L.N.E.R. West Highland Line

By a Railway Engineer

THE West Highland section of the L.N.E.R., the romantic route that winds its way through some of the wildest scenery of Perth and Inverness-shire, has always been an exceedingly difficult line to operate. The gradients alone are bad enough, with long banks at 1 in 60 or 70, but the track is so winding that speed is limited to 40 m.p.h. throughout the distance from Craigendoran, on the Firth of Clyde, to Fort William. Worse even than this, the bridges do not permit any heavier axle load than 20 tons, and this, together with the sharpness of the curves, strictly limits the types of locomotives than can be used.

Before the grouping of the railways in 1923 the West Highland line was part of the North British Railway, and the late Mr. W. P. Reid designed a special type of engine to suit the awkward conditions. These sturdy locomotives, named after glens lying near the route, are one of the hardest-working 4–4–0 designs ever built; with 6 ft. dia. coupled wheels and 20 in. by 26 in. cylinders they were well suited to their special task. But over such long and steep gradients the maximum load they are permitted to take is 180 tons, and in these times with corridor stock and heavy restaurant cars such a tonnage is frequently exceeded. Even the big Gresley two-cylinder "Moguls" are not allowed to haul more than 220 tons without a pilot.



The "Skye Boat Express" about to leave Fort William. It is hauled by L.N.E.R. 4-4-0 No. 9100 "Glen Dochart," of the "Glen" class specially developed by the former N.B.R. for West Highland duties.

During the year 1937 I experienced greater thrills than ever before in the way of locomotive running, speeds of 114 m.p.h. on the L.M.S., 106 on the L.N.E.R., and some magnificent runs in France; but in its way my south-bound run from Fort William on the Skye Boat Express was the equal of any of them. The grand scenery, the strangely fascinating Gaelic atmosphere, and above all the spectacle of a little but very good engine being worked really hard, made this footplate trip one of the most memorable I have ever experienced.

The train leaves Mallaig at 12.5 p.m., shortly after the arrival of the Skye and Hebridean steamers, and on this occasion it was made up to a tare weight of 320 tons. This tonnage is beyond the unaided capacity of any West Highland engine, for even Sir Nigel Gresley's latest masterpiece, *"Loch Long,"* the "Mogul" type engine of the "K4" class, is not allowed to take more than 300 tons. On my run the boat express was worked by two "Glen" 4–4–0s, and with a gross load of 350 tons both engines were loaded practically to their maximum tonnage. No. 9406 *"Glen Croe"* was the leading engine, on which I rode with Driver Cummings and Fireman Peat of Eastfield shed, Glasgow; the pilot, in this case the second engine, was No. 9494 *"Glen Loy."*

The cabs of the "Glen" class engines are rather narrow by present-day standards, but convenient and well sheltered; it was a rough autumn day, with a stiff wind off the Atlantic blowing squall after squall over the mainland, and during each downpour the protection afforded was very welcome. The regulator has two ports, the first of which is used for light steaming, and the reversing gear is adjusted by a vertical wheel. The look-out ahead is somewhat restricted by the narrowness of the cab; this is amply compensated for, however, by a large opening on each side from which a seated engineman can obtain an excellent look-out.

It was three minutes after time when we got the "right-away" from Fort William, and a gentle start was made, along the shore of Loch Linnhe. Although the track is level here it is of no use to work up speed, for only a mile away is Mallaig Junction where tablets are exchanged, as always on this route, by hand. In the next 27 miles the line rises from practically sea level to an altitude of 1,347 ft., that is an average inclination of 1 in 105. As we passed the junction box our driver was looking out to make sure tablets had been properly exchanged—the crew of the assistant engine are responsible for this—and then with a farewell wave to the signalmen we were "right-away" indeed.

"Glen Croe" was now given 42 per cent. cut-off, and the regulator was pushed just beyond the half-way mark, thus opening on to the second or main valve. Beneath the towering northern flanks of Ben Nevis the two engines got into speed very smartly, and in less than a mile of level road were up to 43 m.p.h. But further acceleration was brought to an abrupt end when we struck the first bit of 1 in 59 ascent. With *"Glen Croe's"* exhaust shooting skyward, we forged our way into the foothills of Carn Dearg up a track which at times seemed lost in a boundless tangle of heather. This bank provides but a kind of dress rehearsal for the tremendous climbs farther south; it is barely 1½ miles long, and we breasted the summit at the merest fraction under 30 m.p.h.

On high ground overlooking the entrance of the Great Glen we made excellent speed over a sharply undulating road. Keeping between the limits of 35 to 42 m.p.h. entailed frequent adjustment of *"Glen Croe's"* regulator; for the easier lengths it was brought back to about two-fifths, still on the main valve, and then opened out to nearly three-quarters for the harder stretches. The accuracy with which the 40 m.p.h. speed limit was observed struck me as remarkable considering that the engines are not fitted with speed indicators. By this time we were running into Spean Bridge. The 9.5 miles from Fort William had taken 16½ min., and then, after a stop lasting one and a half minutes, we got away well up the rising track through Glen Spean. The grade here averages 1 in 180 and in just over a mile from the start the two engines had attained 39½ m.p.h. Then came the conditional stop at Roy Bridge.

The restart has to be made right on the 1 in 60 grade. Cummings drove *"Glen Croe"* in full forward gear for the first hundred yards or so, and the noise of the exhaust was tremendous; then he linked up to his favourite position, 42 per cent. cut-off, and pushed the regulator handle still farther over to nearly three-quarters open. With *"Glen Loy"* going equally hard behind us we quickly gathered speed, and as the glen narrowed and we entered the Spean gorge successive quarter miles were taking 34½ seconds, that is 26 m.p.h.

From the footplate the scene is awe-inspiring beyond measure. The river comes leaping and foaming between vertical walls of the blackest rock, carved in places into fantastic shapes by the swirls and eddies of the water; on a seemingly impossible ledge cut in the left-hand rock wall the railway track is carried, and just above the line dense plantations of larch and fir trees clothe the steep hillside. As our two engines thundered round the long sweeping curve of the gorge, from my perch in the cab of *"Glen Croe"* I looked down almost vertically to the dark peaty whirlpool, and a backward look at our long train revealed corridor windows lined with sightseeing passengers.

The gorge is barely half a mile long, and by now the grade was easing and we were coming out on to the Braes of Lochaber; on the

right and a little to the rear the northernmost peaks of the Ben Nevis group rose against the sky, dark and lowering under an approaching squall. Ahead of us now, stretching right across the glen, was the great dam at the foot of Loch Laggan and by this time we were running into Tulloch, which little station makes junction with the road past Loch Laggan to Strathspey and the north-east. The 5.7 very difficult miles from Roy Bridge to Tulloch had taken 12½ min. Excellent work!

Now the track swings round through a full right-angle, and makes for the narrow gap between two great hills whose names are characteristic of this district—Chno Dearg and Stob Choire Easain. In a deluge of rain, with the wind catching us viciously as we turned south, the two engines pounded away on the 1 in 60 bank out of Tulloch. Alongside the river Treig, a mere trickle since the damming up of the loch, we got up to 27 m.p.h., and then quite suddenly came upon the dam itself.

Inside the snow shed on the West Highland line on Rannoch Moor, the only structure of its kind in Great Britain. It consists of concrete walls built up on the natural rock, with an iron roof.

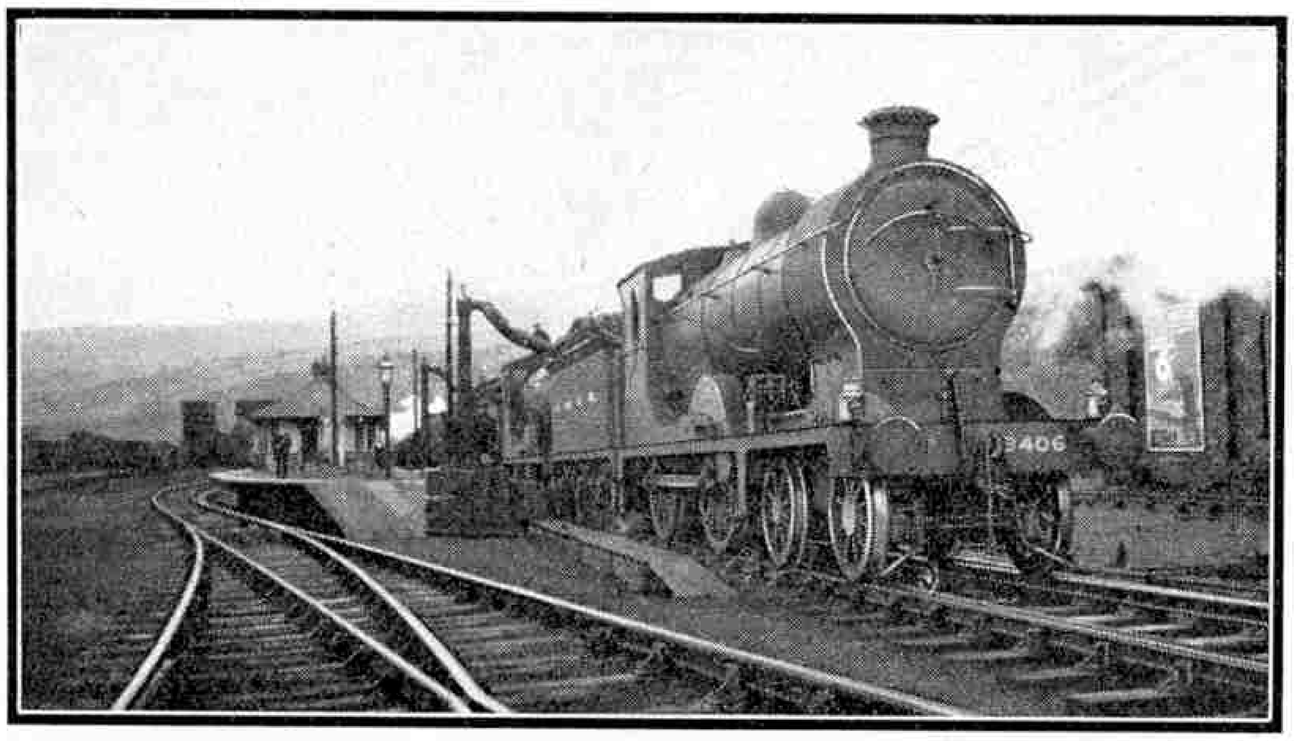
The foot of Loch Treig lies in a very narrow defile, and the dam is less than 200 yards long; here the railway has been re-graded and carried higher up the hillside abreast of the dam. Leaving the old track on our right, we thundered up the new embankment, now doing 30 m.p.h. The banks are still bare and devoid of any vegetation, except in one or two places where grass and heather are creeping upward. Almost opposite the dam there is a short tunnel, and beyond this comes a welcome half-mile of level track till the old line, steeply climbing, is rejoined. Now we accelerated with tremendous rapidity, so much so that Cummings eased *"Glen Croe"* a trifle, and when we joined the old line speed was up to 42 m.p.h.; but nearly six miles of 1 in 67 ascent follow while the railway climbs high above the water. As we toiled upward the noise of the engines' beat grew progressively louder until speed settled down to a steady 28 m.p.h. For two 4–4–0 engines hauling 350 tons up a 1 in 67 bank this was excellent work.

Nearing the head of the Loch, the line, now over 1,000 ft. up, turns eastward; we rounded the southern slopes of Chno Dearg, and forged our way into a perfect wilderness of heather and solemn crags. The railway then doubled back on itself, speed rapidly rose to 33 m.p.h. as we crossed a tiny burn, and then Cummings opened the regulator wider than ever for the last lap, for the final pull up to Corrour is the steepest of all. And so, with snow fences lining the track on both sides, we came to the summit in just 35 sec. over the even hour from Fort William. Corrour lies in the north-west corner of that great watershed of the Central Highlands, Rannoch Moor, and for the next 15 miles the railway crosses a swampy treacherous expanse of wide open country, ringed by a circle of great mountains. On such a day as that of my journey Highland weather is always something of a quick-change artist, and now, as we got away from Corrour, from among the flying clouds sunshine was sweeping the landscape and turning the sombre fallow brown of the autumn moor into wave upon wave of gold and purple, and changing pools of evil-looking black water into sparkling jewels of brilliant blue.

The line across the moor is sharply undulating, but to keep within the 40 m.p.h. speed limit both engines were driven under quite easy steam. So we bowled along until nearing the Black Corries, where speed was brought down to well under 30 m.p.h. in readiness for a very sharply curved length of track. Here we passed through the only snow shed on British railways, an eerie place where the rock cutting walls are extended upward with concrete blocks and the track is protected by a roofing of corrugated iron. After leaving the snow shed a very sharp S-curve round a shoulder of the rough hills on our right brought us over a high viaduct into Rannoch station, in the very heart of the moor.

The 7¼ miles from Corrour had taken just 12 min., and we now set out on a non-stop run lasting nearly three-quarters of an hour, to what was, for me, journey's end. With the mountains at the head of Glen Coe lying away to the west across the moor, we made short work of the easy length to Gortan crossing, this first 7 miles being covered in 11 minutes; but the pace was moderated considerably on the steep descent alongside the Water of Tulla. With the mountains crowding in on all sides again we coasted smoothly downhill, both engines running on compression in full forward gear. Then came a careful slowing through Bridge of Orchy, 15½ miles from Rannoch in 24½ min., and once tablets were exchanged both engines roared out with wide-open regulators for another stiff climb.

Looking right ahead now, up a narrowing glen, the track could be seen climbing to the summit of a high pass; but as we thundered away on the side of Beinn Dorain's perfectly shaped volcanic cone, it was not yet apparent how the line reached that high altitude. From Bridge of Orchy the grade is 1 in 100, and the two engines accelerated so splendidly that in barely 1½ miles we were doing 39 m.p.h.—very nearly at the limit! Then, with the rain sweeping across the glen we turned round eastward into the wonderfully-engineered Horseshoe Bend. This unique piece of railway, carried successively on the flanks of Beinn Dorain, Beinn a' Chaisteil, and Ben Odhar, adds nearly two miles to the straight-line distance from Bridge of Orchy to the head of the pass. A more thrilling stretch of line could scarcely be imagined, and as we crossed the viaducts at the head of the cul-de-sac the pace was noticeably falling off. The grade here steepens to 1 in 55.



Crianlarich, the end of the journey described in this article. The leading engine is No. 9406 "Glen Croe," and No. 9494 "Glen Loy" is next to the train. The water columns are placed to suit the engines of double-headed trains.

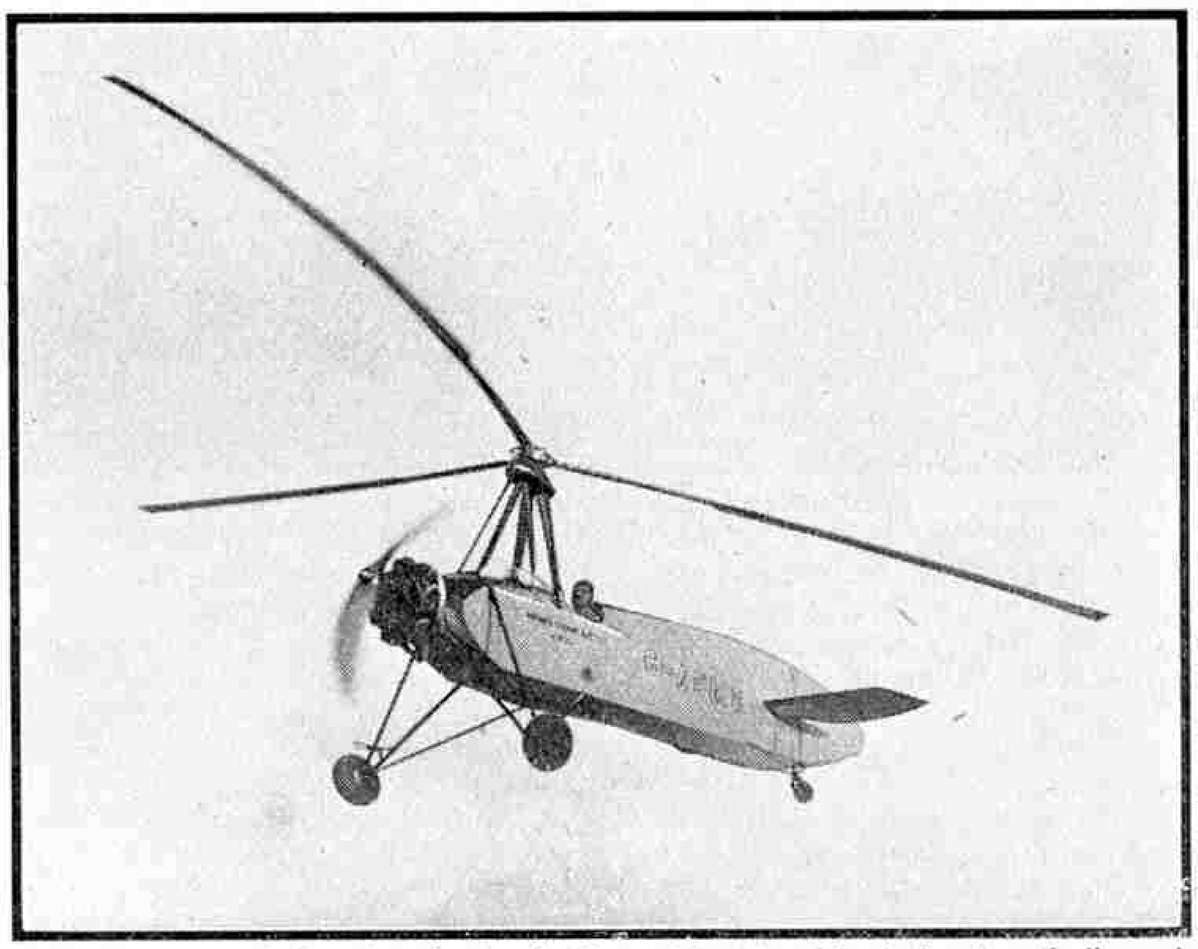
Never was the team-work of the two engine crews better manifested than on this bank. Cummings pushed the regulator still wider open, to nearly three-quarters, *"Glen Loy"* behind was going great guns and, up the continuous 1 in 55 ascent speed gradually dropped to a steady and unvarying 26½ m.p.h.—a magnificent effort. So we came to the summit, 1,042 ft. above sea level, having run 5.8 miles from Bridge of Orchy in 11 min. Now we were coasting again, very slowly through Tyndrum to exchange tablets, and then lying far below the whole length of Strathfillan was revealed. Some five miles ahead, and backed by the greatest mountains in Perthshire, was Crianlarich, my destination, and the village where the West Highland line crosses the L.M.S. route to Oban. Running smoothly down the steep hillside, journey's end came all too soon, and in two hours almost to the second from Fort William we stopped at Crianlarich. On what is by far the hardest half of the run our two "Glens" had between them done some grand work. The 28.1 miles from Rannoch had taken 46 min., and over the complete 64¾ miles from Fort William the running average speed was 33.7 m.p.h. This was a notable performance indeed in such country, but it is quite typical of every-day work over the tremendous banks of the West Highland railway, when the 40 m.p.h. speed limit effectively prevents any high overall speeds.

The Hafner Gyroplane

An Interesting New Type of Wingless Machine

ONE of the drawbacks of aeroplanes of the usual type is that they need a considerable run along the ground both when taking off and when landing. Various schemes have been tried for reducing the length of run required. In the most successful of these the wings have been replaced by a rotor consisting of two or more blades, the most suitable number being three, which are attached to a hub that permits them to rotate about a vertical axle, which is usually mounted on a pylon structure above the fuselage. The blades are similar in section to the wings of ordinary aeroplanes. When the machine is being pulled through the air by its propeller, they are kept in motion by the flow of air past them, and engine power is applied to them only to start rotation, and to speed it up before the machine leaves the ground.

A machine of this kind, in which all the lift is provided by the rotating blades, is known as a gyroplane. A very interesting and promising gyroplane has recently been designed by Mr. R. Hafner, a Viennese engineer, and an experimental machine known as the A.R. III Hafner Gyroplane, has been built by A.R. III Construction at Feltham. This machine is shown in flight in the upper illustration on this page. It has proved itself capable of taking off, without a forward run, in a steep climb reaching a height of 1,000 ft. in 50 secs., and it is estimated that it is capable of clearing a standard screen 66 ft. in height from a standing start about 60 yds. away. It is equally efficient in landing. It can descend almost vertically, and with it there is no need for a preliminary glide or for a forward run on alighting.



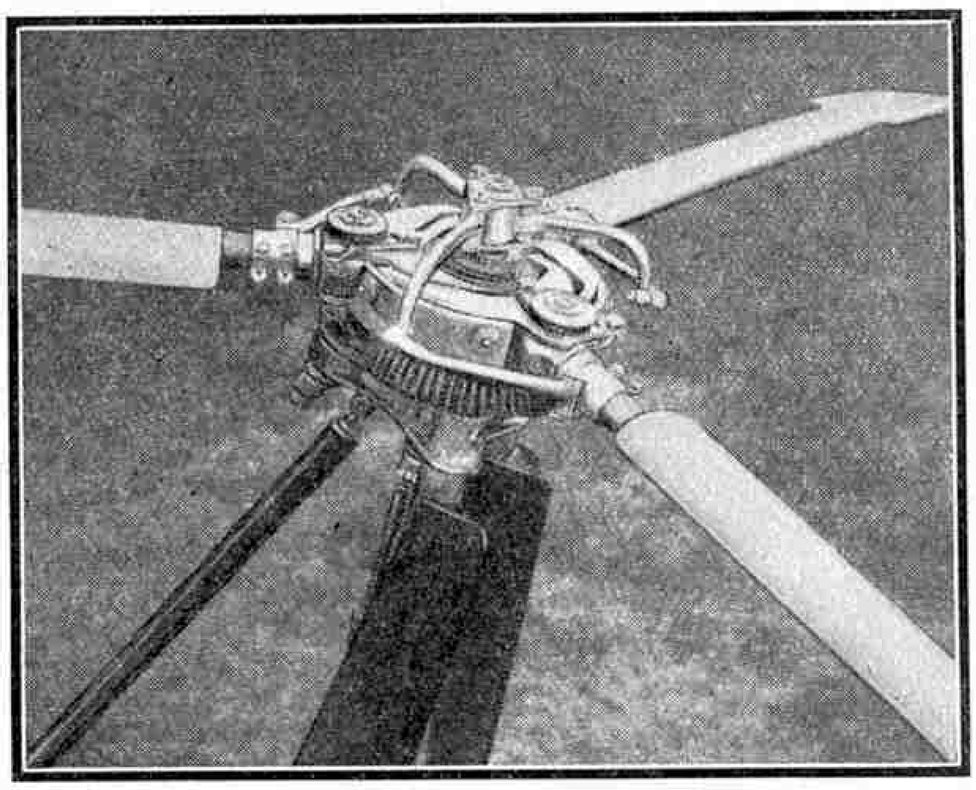
The Hafner A.R. III Gyroplane in the air. It can take off and land almost vertically, and the rotor provides the lift during flight. The illustrations to this article are reproduced by courtesy of A.R. III Construction, Feltham.

The novel feature of the Hafner gyroplane is the design of the hub around which the blades rotate. These are attached by means of hinges that to a certain extent allow the blades to "flap" up and down, and to vary their spacing around the hub, as in previous machines of this type. This allows for the difference in lift between the side of the machine on which the blades are moving forward during flight, and that on which they are moving backward. The blades adjust their positions automatically by means of these flapping and rocking movements.

In ordinary gyroplanes changes of course are effected by tilting the rotor carrying the blades. In the Hafner machine the blades are "feathered" or twisted to present a larger or smaller angle to their plane of rotation, and thus to increase or decrease the lift of each blade as desired.

This is brought about in an ingenious manner. The blades are attached to their root knuckle fitting by tie rods, which carry the centrifugal loads without introducing friction into the control. These rods are sufficiently flexible to permit the required variation of incidence of the blade, and in twisting provide a spring that tends always to return the blade to its normal setting, that is to stabilise it in its circular path. At the root or inner end of each blade is a crank arm, the outer end of which is attached to one of the three arms of what is called a "spider," which is mounted on a spindle in the centre of the hub. This construction is shown in the lower illustration on this page. The connections are made by ball joints, and the arms act as levers to control the setting of the blades as the spindle is moved. When this spindle is tilted by the joystick it pushes the levers down on one side, reducing the blade angle, and raises them on the other, where the blade angle is increased. The plane of rotation is thus varied and the aircraft banks, dives, or climbs accordingly. When the spindle is tilted to the left there is greater lift on the right hand side of the machine, and the result is a left bank and turn. A turn to the right is effected by tilting the spindle in that direction, while climbing and diving are brought about by tilting the spindle backward and forward respectively.

The spindle, with the spider mounted on it, also can be raised or lowered by use of another control known as the lift lever. When the spindle is simply lifted, so that all three arms are raised, the angles at which the blades are set are increased equally, giving greater lift. Similarly lift is reduced or taken off altogether by lowering the spindle. This is specially useful when taking off. The blades are "feathered," or turned to have little lift, and the rotor is spun rapidly by means of a drive from the motor. As soon as a sufficient amount of energy has been stored up in this rotation the spindle is raised to give lift, and this is sufficient to enable the machine to rise without a run. It will be seen that lift can be introduced, changed or removed at will, giving delicate and efficient control in all conditions and at varying speeds of flight.



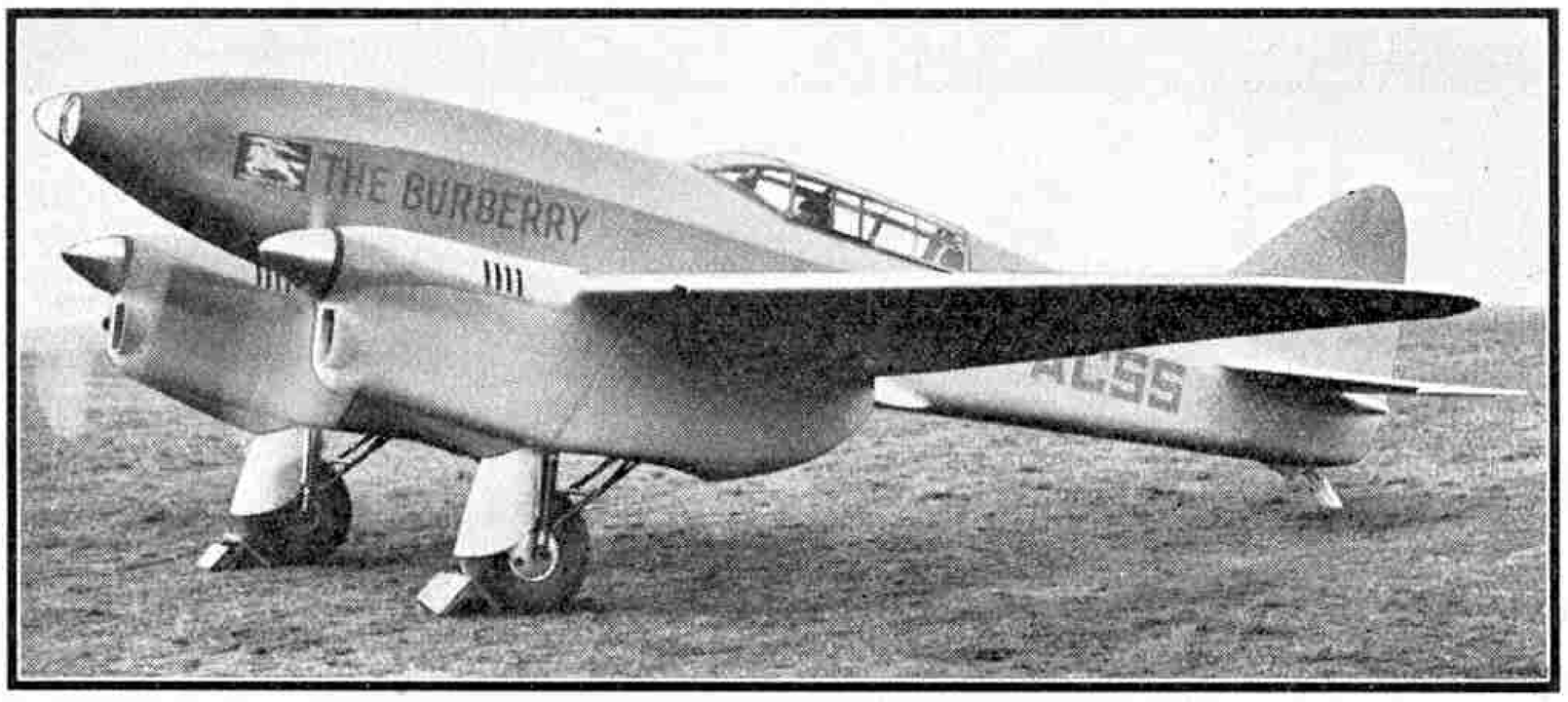
A near view of the rotor head, showing the three-armed "spider" by means of which the angles of the blades are varied.

The experimental Hafner gyroplane is a single seater fitted with a 84 h.p. Pobjoy "Niagara" engine, which has been modified to drive the inclined shaft by means of which the rotor is spun when the machine is on the ground before taking off. The overall length is 17 ft. 10½ in. and the height is 8 ft. 8 in., and the rotor spins in a circle measuring 32 ft. 9 in. across. The machine has an all-up weight of 900 lb., the fuel and oil carried giving a range of 170 miles in level flight. The cruising speed is about 110 m.p.h., and the speed range extends from 12 m.p.h. to more than 120 m.p.h. The wide range of flying speeds of the machine is remarkable. Its capacity for slow flying has been shown in a striking manner by flying it just clear of the ground with a man running alongside. The delicate controls enable it to make rapid sharp turns with ease, to carry out vertical and hovering descents with the engine running or switched off, and to perform other manœuvres, such as steeply-banked turns, with the wheels just clear of the ground.

To Capetown and Back in Six Days

Clouston's Magnificent Flight

TO Capetown and back within a week! This record feat was accomplished last November by Flying Officer A. E. Clouston, a test pilot at the Royal Aircraft Establishment, Farnborough, and Mrs. Kirby-Green, an enthusiastic airwoman. The flight was a great triumph of navigational skill, as the D.H. "Comet" employed did not carry any radio equipment, and the pilot had to rely entirely upon his navigation instruments. A great deal of careful planning beforehand, particularly with a view to avoiding night landings, also contributed to the success of the venture.



The D.H. "Comet" monoplane in which Flying Officer A. E. Clouston and Mrs. Kirby-Green flew to Capetown, South Africa, and back within a week, a record achievement.

Flying Officer Clouston and Mrs. Kirby-Green took off from Croydon at 9.55 p.m. on 14th November, and in spite of rough weather and storms during the night they flew the 2,300 miles to Cairo at an average speed of 208 m.p.h., arriving there at 8.59 a.m. next morning. They left just over an hour later on the 1,050-mile flight to Khartum, and their average speed over this section of the route was 201 m.p.h. A stay of four hours at Khartum had been planned. Unfortunately the necessary permission to fly across the Sudan Desert had not been obtained in advance, and the time was spent in a hurried search by motor car for the authorities able to grant this permission. Eventually these were located, and the formalities were completed.

The fliers left Khartum at 10.30 p.m., three hours late. Johannesburg was 3,000 miles farther on, and although the still-air range of the "Comet" was about 2,800 miles, Clouston hoped, with the help of a tailwind, to be able to reach that city without a stop. The wind was against him, however, and forced him to refuel at Broken Hill, where he arrived at 9.8 a.m. on 16th November. He averaged 207 m.p.h. on this long flight, keeping on his course throughout the night, and Johannesburg was reached by early afternoon. A start was made almost immediately for Capetown and there, shortly after dusk, a large and enthusiastic crowd saw the "Comet" approaching. Clouston circled the airport for five minutes before landing. The 7,000-mile flight from England had been accomplished in 45 hrs. 2 min., which was 33 hrs. 24 min. less than the time taken by Miss Amy Johnson on 4th–7th May, 1936.

During a stay of two nights and a day at Capetown the engines of the "Comet" were given a 25-hr. schedule inspection. Then at 6 a.m. on 18th November, Clouston began the attempt to fly back to England in record time. The weather was good, and Johannesburg was reached in four hours. After a pause of only 40 min. the flight was continued to Broken Hill, where the machine was landed at 2.55 p.m. after covering the 900 miles at an average speed of 197 m.p.h. Sharp showers of rain on the Rhodesian stretch of the flight developed into a torrential storm at Broken Hill, and it was impossible to fly on. For two hours the "Comet" stood unattended in the downpour, and afterwards it was necessary to wipe out such vital components as the magneto distributors before restarting the engines.

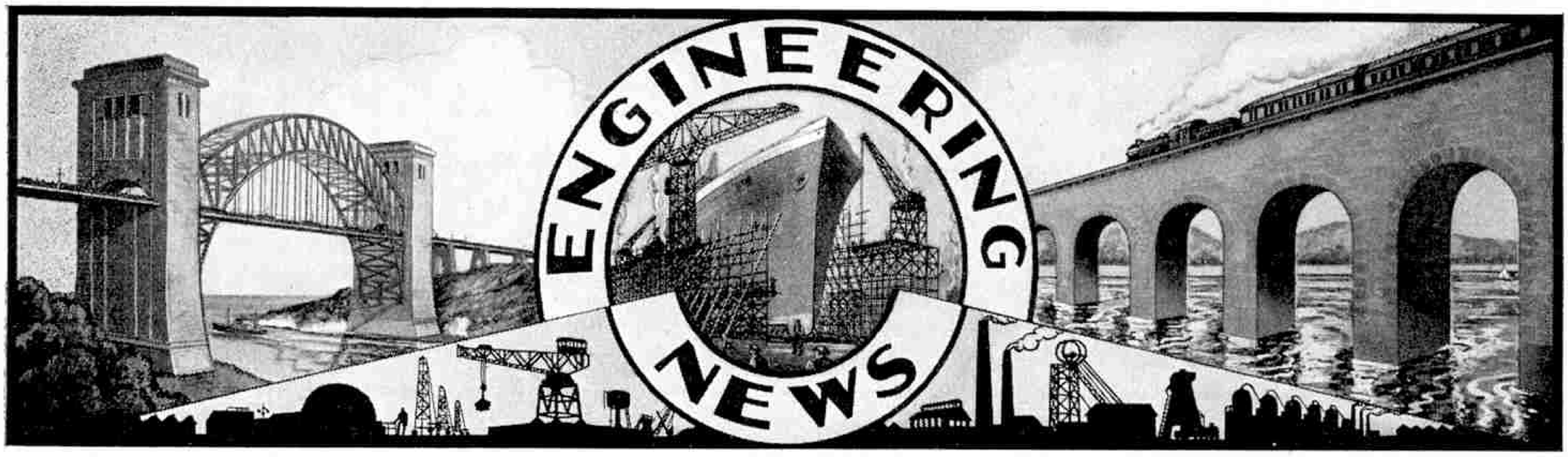
A start from Broken Hill was made after midnight, and conditions were not really difficult that night or next day. The Moon gave ample illumination up to daybreak, and visibility was fair to good, except when thunderstorms were encountered over the Sudan. Mrs. Kirby-Green, an amateur pilot of limited experience, proved able to keep a compass course, and over stretches that were sparse in landmarks Clouston was thus enabled to attend to navigation, and even to rest a little.

At Cairo 4½ hrs. were allowed for a meal and some sleep, and after a midnight start the real climatic troubles of the flight began. The 2,300 miles between Cairo and Croydon had been the most difficult section of the outward journey, and they provided many worse problems and some danger on the return. Severe headwinds were encountered, detours had to be made, and near the French coast icing conditions grew so serious that a special fuel tank vent, arranged in the cockpit where it could not freeze up, had to be brought into action. But for this special vent the "Comet" might have come down in the Mediterranean. At the same time northerly winds were so strong that ships were hove to until the weather improved. The difficult conditions made it uncertain whether the 2,300 miles could be covered non-stop on one tank filling, and the fliers therefore alighted at Marseilles, cold and fatigued. The machine was refuelled in 30 min. and they flew on into improved weather, to find England under a cloudless sky but with a typical autumn mist impairing the visibility.

Flying Officer A. E. Clouston, of the Royal Aircraft Establishment, Farnborough.

At 3.15 p.m. the "Comet" appeared over Croydon control tower, and such was Clouston's patience and caution even at this last stage that he spent 10 min. making six circuits of the airport before he finally landed into the mild glare of the Sun. The return flight from South Africa had been accomplished in 57 hrs. 23 min., or 38 hrs. 55 min. less than the record time set up by H. L. Brook in a Percival "Gull" monoplane in May 1937. By flying to Capetown and back in 5 days 17 hrs. 28 min. Flying Officer Clouston and Mrs. Kirby-Green almost halved the record time set up by Mr. Brook, who took 10 days 9 hrs. 28 min. for the double trip.

The D.H. "Comet" twin-engined low wing monoplane with which Clouston achieved his astonishing feat of accurate long-range navigation is the one used by C. W. A. Scott and the late T. Campbell Black, when they won the England–Australia Air Race in October 1934 by flying from Mildenhall to Melbourne, 11,300 miles, in 71 hrs. 18 sec. On that occasion the aeroplane was equipped with D.H. "Gipsy Six" Series I type engines specially prepared for racing. In August last year the machine was flown by Flying Officer Clouston, accompanied by Flight Lieut. G. Nelson, in the Istres–Paris–Damascus air race, and finished fourth. For that race the engines were replaced by two of the standard "Gipsy Six" Series II type, and the "Comet" was equipped with these during the record-breaking flight to Capetown and back.



A Giant Steel Ingot

The demand for very large metal parts for use in great engineering undertakings of recent years has been met by the steel maker, who has produced ingots of suitable size. The illustration on this page shows a giant steel ingot produced recently at the Vickers Works of the English Steel Corporation Limited. This is easily the largest yet produced in this country, weighing 230 tons and measuring approximately 25 ft. in length and 10 ft. across.

Four acid open-hearth furnaces were used in making the huge mass of metal required for this ingot. These had to be very carefully and skilfully operated in order to bring the metal in each furnace to the desired condition at a definite time, so that when pouring was started it could proceed without interruption until the mould was full. How the steel is made, and the pouring carried out, was described in an article on page 638 of the issue of the *"M.M."* for November 1937.

After cooling in a soaking pit the ingot was reheated and forged by means of a 7,000-ton press operated by a high-pressure electric hydraulic pumping set. The press is the largest of its type in the world and is designed to deal with ingots up to 300 tons in weight.

An Indicator for Trolley Bus Drivers

A recent development in connection with trolley omnibuses is a simple indicator designed to give the driver of a bus audible warning when the trolleys "jump" the overhead conductor wires. The apparatus consists of a normally closed relay, which is connected across the current supply to the motors, and includes also a buzzer operated from the lighting battery. As long as the trolleys remain in contact with the overhead conductors the relay is held open by the supply current, but as soon as either trolley leaves its wire the supply current is cut off and the relay closes, completing the buzzer circuit and setting the alarm in operation. A tumbler switch is provided for opening the buzzer circuit when the trolleys are removed from the conductors when the vehicle is in the terminal depot.

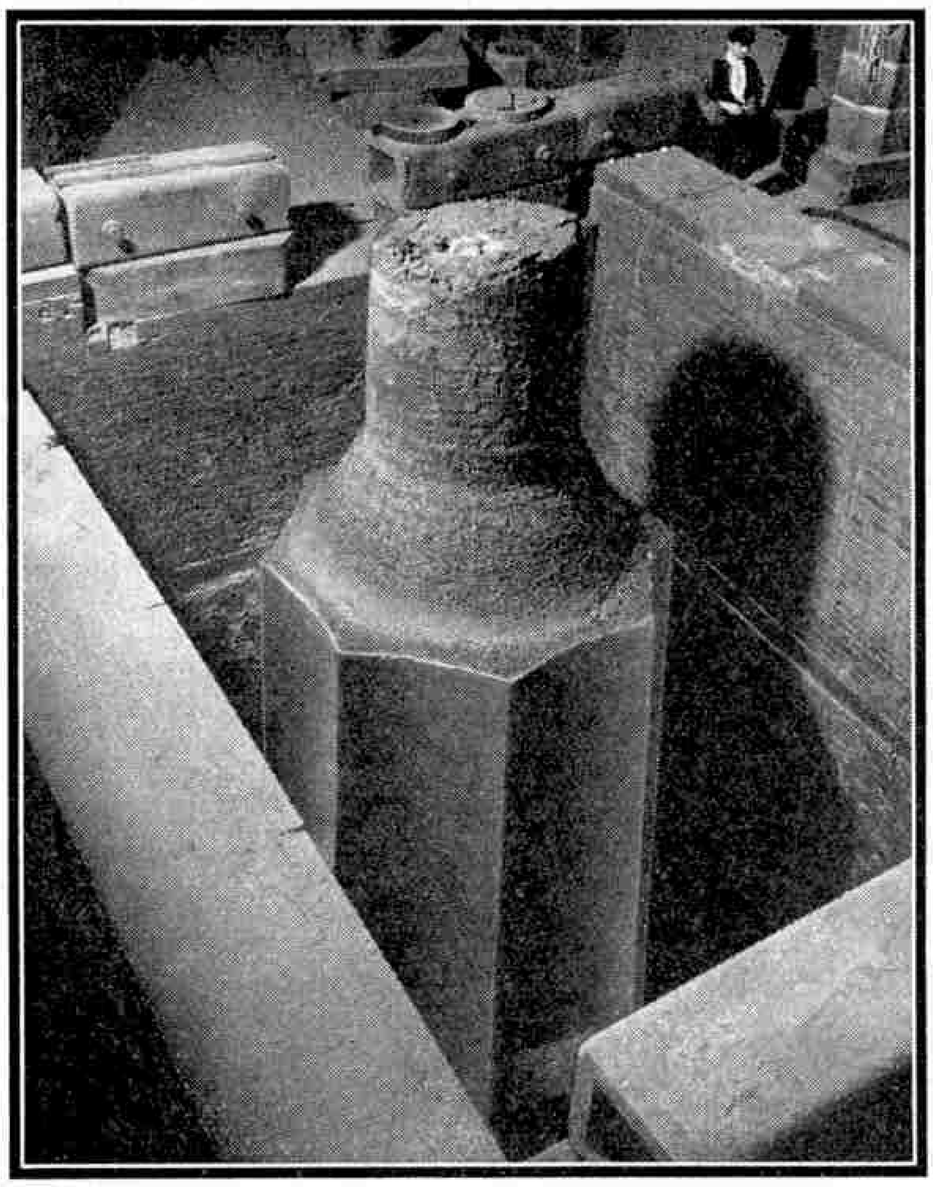
Devonport Dockyard Extension

Work is now in progress at Devonport Dockyard on extensions to No. 10 Dock in order to make it capable of accommodating the largest ships in the British Navy. The cost of reconstructing the dock will be about £400,000, and £128,000 worth of new machinery is also to be provided.

Unique Tunnel Driving

The Yerba Buena Tunnel, which is bored through a rocky island and links the two sections of the San Francisco–Oakland Bridge, has the largest section of any tunnel yet built. It is 79 ft. wide at the spring line, more than 57 ft. high in the centre, and 540 ft. long, and was constructed by a most unusual method, in which the sidewalls and arch that constitute its lining were placed in position before the central core of rock was removed!

Operations were commenced by excavating drifts measuring 14 ft. square on the line of each side wall, and running the full length of the tunnel. These were stoped to a height of 40 ft., after which the concrete sidewalls were poured. Excavations for the arch ring were then made, the spoil being dropped into the space inside the sidewalls. The roof was supported until the concrete arch was completed by beams, the lower ends of which rested on the central core, and only after the sides and roof had been completed was the interior rock excavated.



A giant steel ingot weighing 230 tons, after removal from the mould. It is the largest yet made in this country, and was produced by the English Steel Corporation Ltd., Sheffield, to whom we are indebted for our photograph.

Records in Skyscraper Erection

A 36-storey structure known as Nine Rockefeller Plaza is the 11th building to be constructed in the Rockefeller Centre, New York. It is the third tallest of the group, and has a height of 490 ft.

Several records for constructional work were set up during the erection of the building. In a period of 64 working days after the excavations for the foundations were commenced 46,600 tons of earth and rock were removed, and this was carried away in 5,499 lorry loads, an average of 86 loads daily. The erection of the steelwork was very rapid and was entirely completed in 43.2 working days, in which period a total of 9,000 tons of steel was erected at the average rate of 200.8 tons per day.

Some of the pieces of steel handled were very heavy, the first tier columns alone weighing 35 tons each. About 90,000 rivets were used in erecting the framework, and more than 1,000 workers of all trades were often engaged at one time.

Concrete Pontoon Bridge

If a scheme that is now under consideration is carried out, Lake Washington, at Seattle, in the United States of America, will soon possess a concrete pontoon bridge. There are several large steel pontoon bridges already in existence in various parts of the world, two of the most notable being those at Istanbul and Coblenz, but that now proposed will be the only one of its kind in the world.

The bridge will have a total length of 8,000 ft. made up of a series of concrete pontoons, fastened together and anchored to a submerged island at a point where the water is only 36 ft. deep. According to present plans the bridge will carry four traffic lanes and two footpaths. It is possible that a movable span will be included so as to permit the passage of large boats, and this will be either a bascule structure or a swing bridge operated by propellers driven by mechanism controlled from the bridge itself.

New Bridge Across the Mississippi

Construction has commenced of a new cantilever bridge over the Mississippi River at Baton Rouge, Louisiana. The bridge will be known as the Baton Rouge Bridge. The main structure will be 3,326 ft. in length and will carry a single track railway and a roadway 18 ft. wide, and the approaches will be 8,900 ft. long. Thus the total length of the bridge and its approaches will be more than 12,000 ft., or about 2–1/3 miles.

A Novel Double-Deck Roadway Scheme

A novel system of double deck roads to cope with the ever increasing traffic in Chicago's streets, has been suggested by Mr. Lewis Russell, an engineer and member of the city council. There have been previous suggestions for double-decker roads, but Mr. Russell's plan differs from any of the systems yet proposed by placing the fast traffic street below the level of existing roads instead of above. The lower road would be laid at the bottom of a concrete trench excavated on the line of an existing roadway, and the upper road instead of being surfaced with ashphalt or concrete would be simply a steel mesh gridwork laid across the top of the trench. The steel mesh would permit daylight to penetrate through to the road below, and it is thought that the speed of moving vehicles on the lower road would create sufficient draught to suck down a continuous stream of fresh air.

It is interesting to note that open steel mesh for roadways is already in actual use in America. In East Chicago there is a bridge with a roadway consisting of bars of steel measuring about $2\frac{1}{2}''$ by $\frac{1}{4}''$, set $2\frac{1}{2}''$ apart and linked together by crisscross members.

Great Canadian Power Scheme

Engineers of the British Columbia Department of Lands have discovered a new source of hydro-electric power, which, if their suggestions are carried out, will some day provide energy for the west coast industrial area. After many years of investigation they have found a practical method of altering the course of the Nechako River, which at present runs eastward to the Fraser River near Prince George, so that instead it will run westward to Dean Channel, on the Pacific coast. If diverted westward as suggested, the fall of the water would develop one million horse-power, which is nearly twice the total power now being developed and used in British Columbia industrial plants.

The scheme would involve the construction of a 10-mile tunnel through the mountains to carry the waters of two lakes into the headwaters of the Kimsquit River, which runs into the head of Dean Channel.

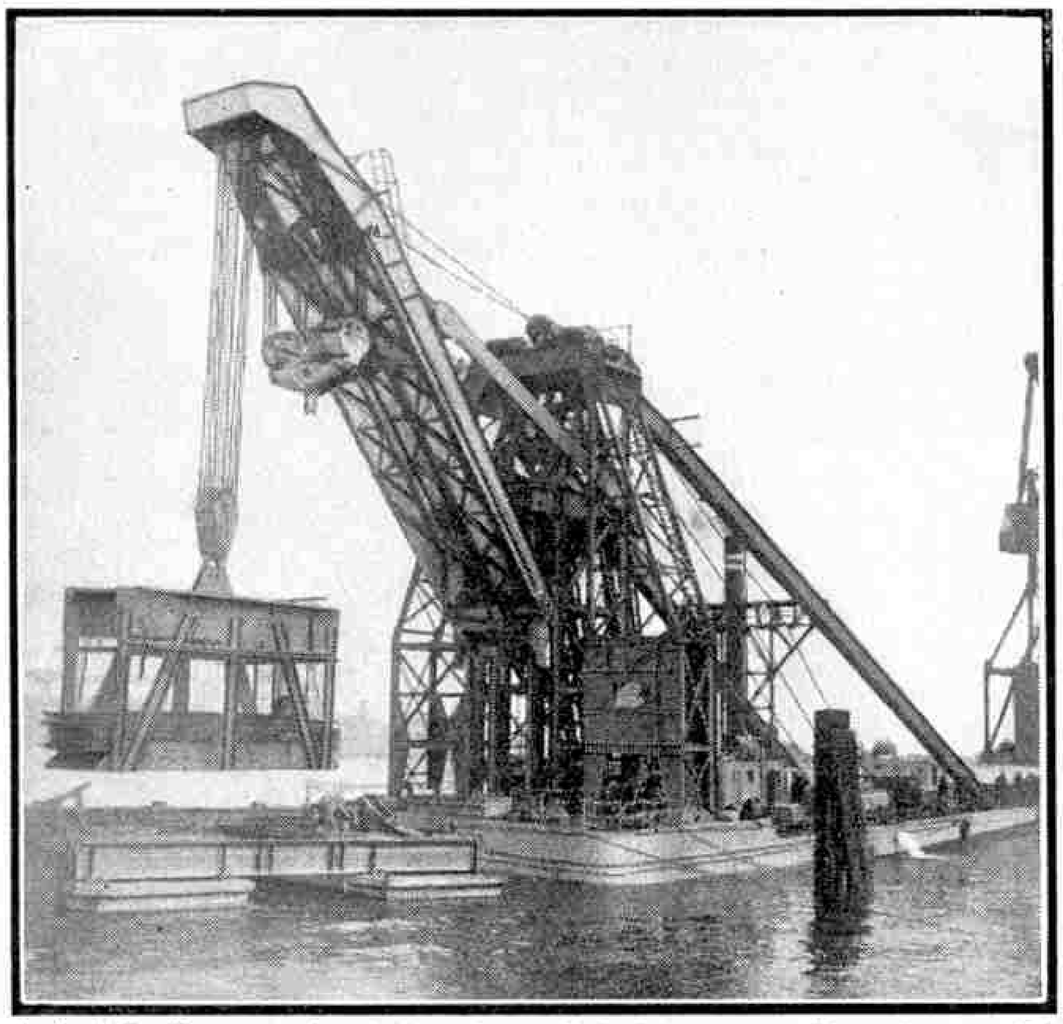
An Unusual Street Sweeper

An engineering firm in Cleveland, U.S.A., has recently shipped to South America a number of street sweepers of an interesting type, which will be used in the streets of one of the suburbs of Buenos Aires. The machines are very lightly built and run on six pneumatic tyres, the total load being so distributed that the load on each tyre does not exceed 700 lbs. This allows the machines to be used on pavements as well as on roadways, and in places where heavier machines might break through.

All the controls are placed inside the driver's cab, and the engine, transmission, rear driving axle and differential are standard parts used in Chevrolet $1\frac{1}{2}$ ton vehicles. The broom sweeps a path 5 ft. wide, and can be driven at any one of eight different speeds, while the machine itself has four travelling speeds, and can turn in a radius of only 6 ft. 6 in.

Porcelain Tubes for Insulating Cables

Porcelain tubes have been used in Germany for insulating a high voltage electric cable. The tubes are each about 6 ft. long, and are connected end to end with special joints made of synthetic rubber.



A giant floating crane for the Manchester Ship Canal. It can lift loads up to 250 tons and will be described in an article in next month's issue. Photograph by courtesy of Werf Gusto Ltd. (Firma A.F. Smulders) Schiedam, Holland.

The New Thames Tunnel

Work on the new tunnel under the River Thames has been commenced with the setting up of air locks for the sinking of a pilot shaft. Including approaches the tunnel will have a length of more than a mile, and will cost £4,000,000.

The World's Tallest Building

Constructional work is now in progress in Moscow on what will be the world's tallest building. When completed it will be 1,300 ft. high.

Windmills for Electricity Generation

An electric power station, in which the generators will be driven by wind power is being erected on the top of a mountain 4,300 ft. high near Yalta, in the Crimea. The station will be equipped with a windmill having a three-bladed wheel 262 ft. in diameter, which will be mounted in such a manner that it will operate under a wind from any direction. The designed capacity of the plant is 10,000 kW, which will be generated by two units of 5,000 kW each.

One Pound of Wire Worth £30,000,000

Very fine wire is required in the manufacture of certain kinds of galvanometers, used for detecting extremely small electrical currents. The wire in some of these instruments is made of aluminium, and is so fine that 10,000 pieces laid side by side would measure only one inch in width! This wire is worth about £30,000,000 per lb., although the value of the metal itself is only a few shillings.

Another Large American Water Power Scheme

Work is soon to start on still another huge water power and navigation scheme in America. The Cooper River in South Carolina is to be deepened, and Charleston Harbour, into which the river flows, is to be considerably improved in order to facilitate water transportation between Charleston and Columbia. In addition two dams will be built to develop power and divert water from the Santee River into the Cooper River. One known as the Santee Dam will create a lake about 35 miles long, which will supply water for the power plant, while the other will control the flow and diversion of water into the Cooper River.

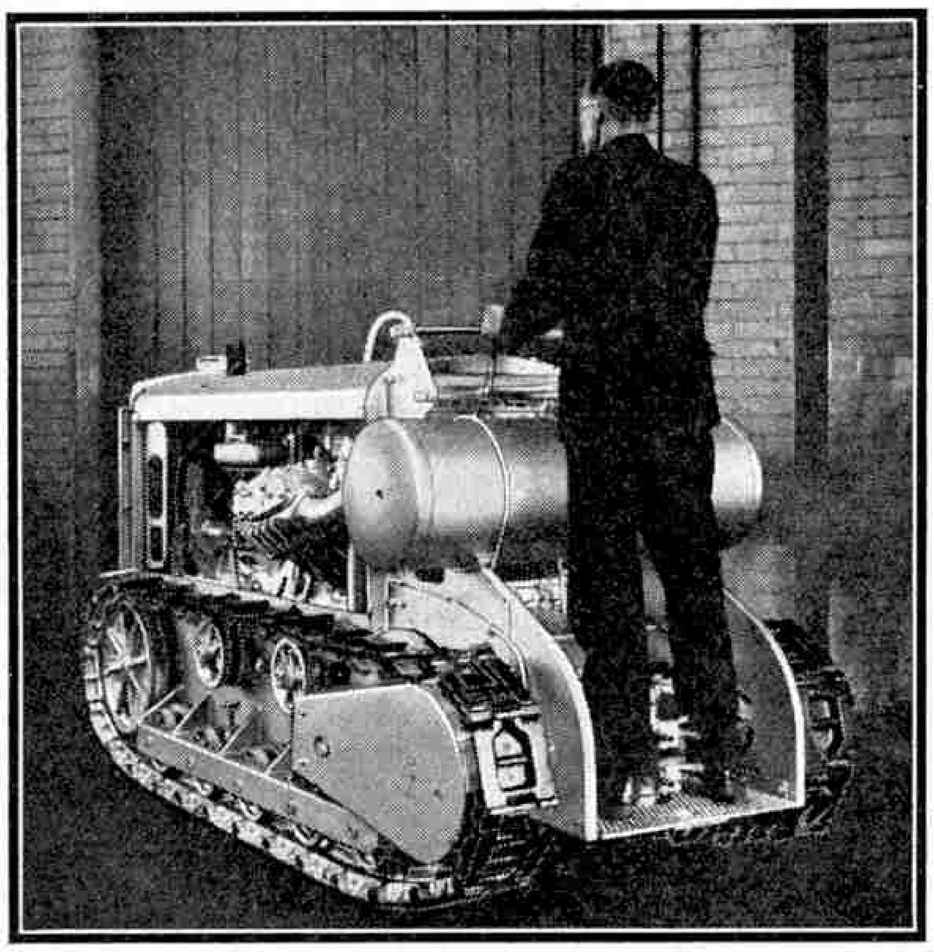
The entire scheme will involve an expenditure of about £7,400,000.

A Novel Portable Air Compressor

The lower illustration on this page shows a novel portable air compressor, known as the "Crawl-Air" compressor and made by the Ingersoll–Rand Company Ltd., London. It has been found particularly useful in railway track work, as it is narrow enough to travel between the rails or in the 6-ft. way. The output of compressed air is sufficient to operate simultaneously several tools of different kinds, such as drills and tampers.

The chief feature of the machine is that it transports itself by means of creeper tracks driven independently by air-operated motors. The two motors not only supply the motive power, but also act as air brakes to prevent the machine from running away when working on a steep incline.

The machine can be moved forward or backward over rough ground, can turn on its own axis, climb a gradient of 1 in $2\frac{1}{2}$, and load itself on to a railway wagon. Its low centre of gravity allows it to move along sloping banks without overturning, providing the angle of slope does not exceed 45 deg. The compressor itself is operated by either an oil or a petrol engine as desired.

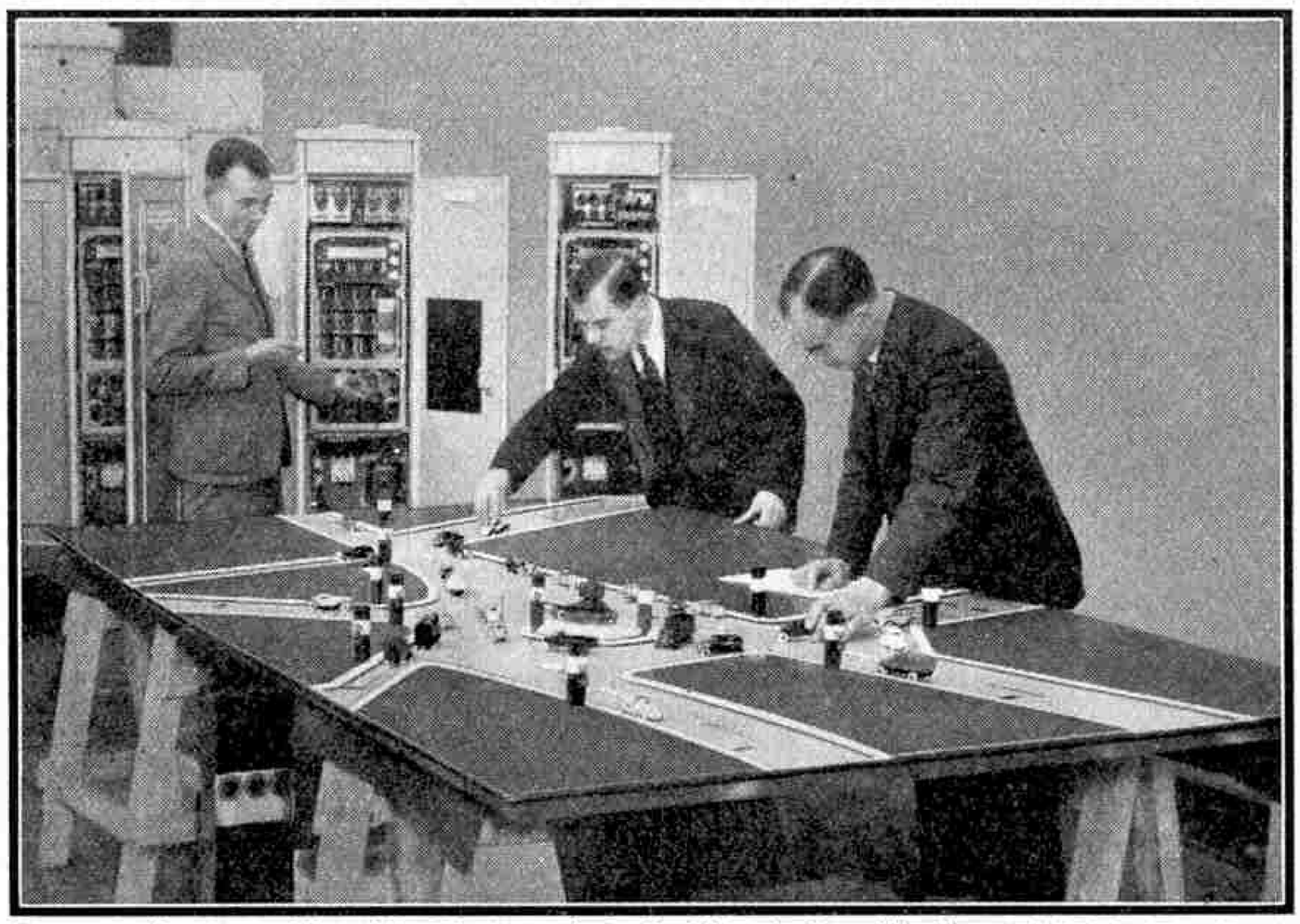


A portable air compressor that travels on creeper tracks operated by air motors. Photograph by courtesy of the Ingersoll-Rand Co. Ltd.

Traffic Signals in Piccadilly Circus

Controlling 6,000 Vehicles an Hour

DURING the last few years the ever-increasing volume of traffic both in the centres of busy towns and cities and along rural highways has made control more and more intricate and difficult. Control by police, although efficient, exposes the constables to every inclement weather condition—a strain upon the physical limitations of any human being—and also necessitates the detaching of a policeman from other police duties, an inconvenient and uneconomical procedure. Inventors therefore tried to find a mechanical substitute that would do the work. The result of their efforts has been the introduction of the vehicle-actuated traffic signal that is now such a familiar feature. The change has had the effect of speeding up traffic at busy junctions by enabling it to flow more smoothly and without possibility of misunderstanding of signals, for the indications given by the red, amber and green lights of the signal lanterns are simple and definite.



Demonstrating the working of the Electro-matic Traffic Lights in Piccadilly Circus with Dinky Toys Motor Cars on a scale model. The illustrations to this article are reproduced by courtesy of Automatic Telephone and Electric Co. Ltd., Liverpool.

The earliest form of traffic signal worked on a fixed time cycle, with regular intervals of "Stop" and "Go" for each road leading to the junctions or intersection. This system was reliable, but led to unnecessary loss of time, as vehicles were liable to be held up by the "Stop" signal although the other approach roads were clear. A great improvment came with the introduction of the Electro-matic system, in which each vehicle automatically registers its claim to the right-of-way, which is then given to it at the earliest possible moment by the signal. This wonderful traffic control equipment is manufactured by Automatic Telephone and Electric Co. Ltd., Liverpool, and its working was fully described in the "*M.M.*" for May 1933. The general scheme is now familiar to most people. A detector pad sunk in the roadway is placed in the path of every vehicle approaching a crossing where the system is in operation. The pad is a simple contact-making device operated by pressure. When the weight of a vehicle passing over it brings the two contacts together, they close an electric circuit in the control apparatus, and this sets in motion a series of operations that eventually change the light from red through red and amber to green, or from green through amber to red. Any one vehicle may be delayed if there is heavy traffic across the other road of the intersection, but the signals never forget that it is waiting and give it the right-of-way as soon as possible, special devices limiting the period during which it is held up.

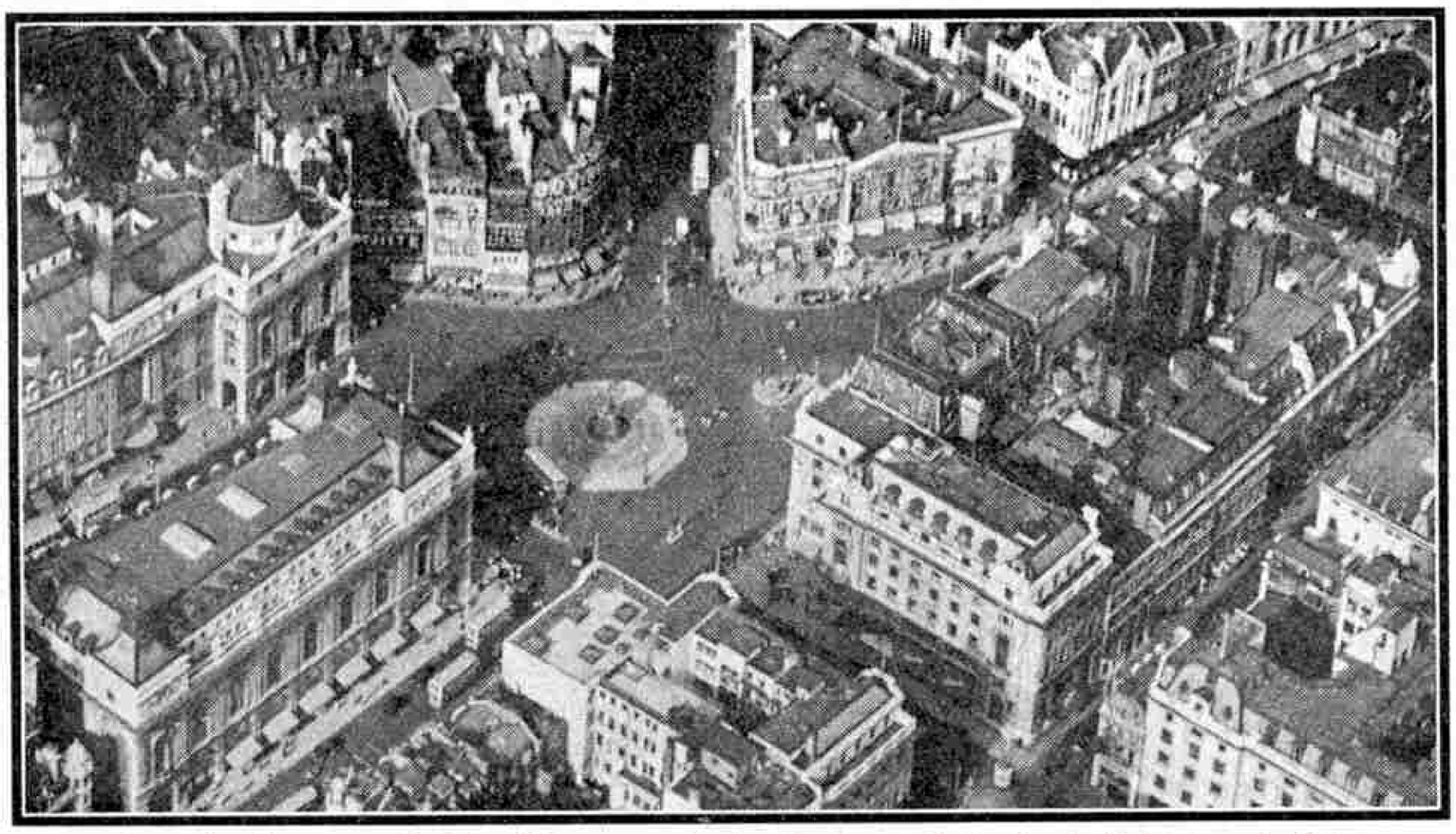
Within the last five years 'Electro-matic' Traffic Signals have been established on more than 1,200 road intersections in Great Britain. Many overseas centres also have installed these signals, among them Paris, Berlin, Brussels, Milan, Antwerp, Johannesburg, Sydney, and Durban, and a very large number has been brought into use in America.

There has been a continual development of the system since its introduction, and to-day it is capable of taking complete charge of traffic at the most complicated junctions, no matter how many roadways intersect, nor how dense the traffic flowing along them. Proofs of this have been given in various parts of London. The Blackfriars Bridge area is one example of a group of difficult intersections, traversed by huge volumes of traffic, which are successfully controlled by Electro-matic signals. Another is Hyde Park Corner, where the density of traffic is greater than in any other part of London. The system won a great triumph when it was applied to Trafalgar Square. There the Electro-matic signals govern the complicated sets of crossings with complete success, ensuring smooth and rapid movement of the many streams of vehicles passing along the roads on which the signals have been installed.

The Electro-matic system in Piccadilly, described in the "*M.M.*" for May 1934, is a remarkable example of adaptation to special problems. The locality is generally regarded as one of the worst traffic spots in London, because at certain hours both main and cross streets carry traffic to their maximum capacity. A long stretch of Piccadilly is controlled, each intersection having its own detectors, signals and controller, and in addition there is an overall system of automatic linking. This co-ordinates the traffic in order to give a smooth flow. The signals are timed to give immediate right-of-way on arrival at each intersection in turn, and groups of vehicles can traverse the full length at average speed without stopping instead of in a series of irregular movements, liable to stoppage at any or all of the signal points.

The latest triumph of the Electro-matic system is the installation recently completed at Piccadilly Circus, which formerly was notorious for its traffic jams. Prior to the

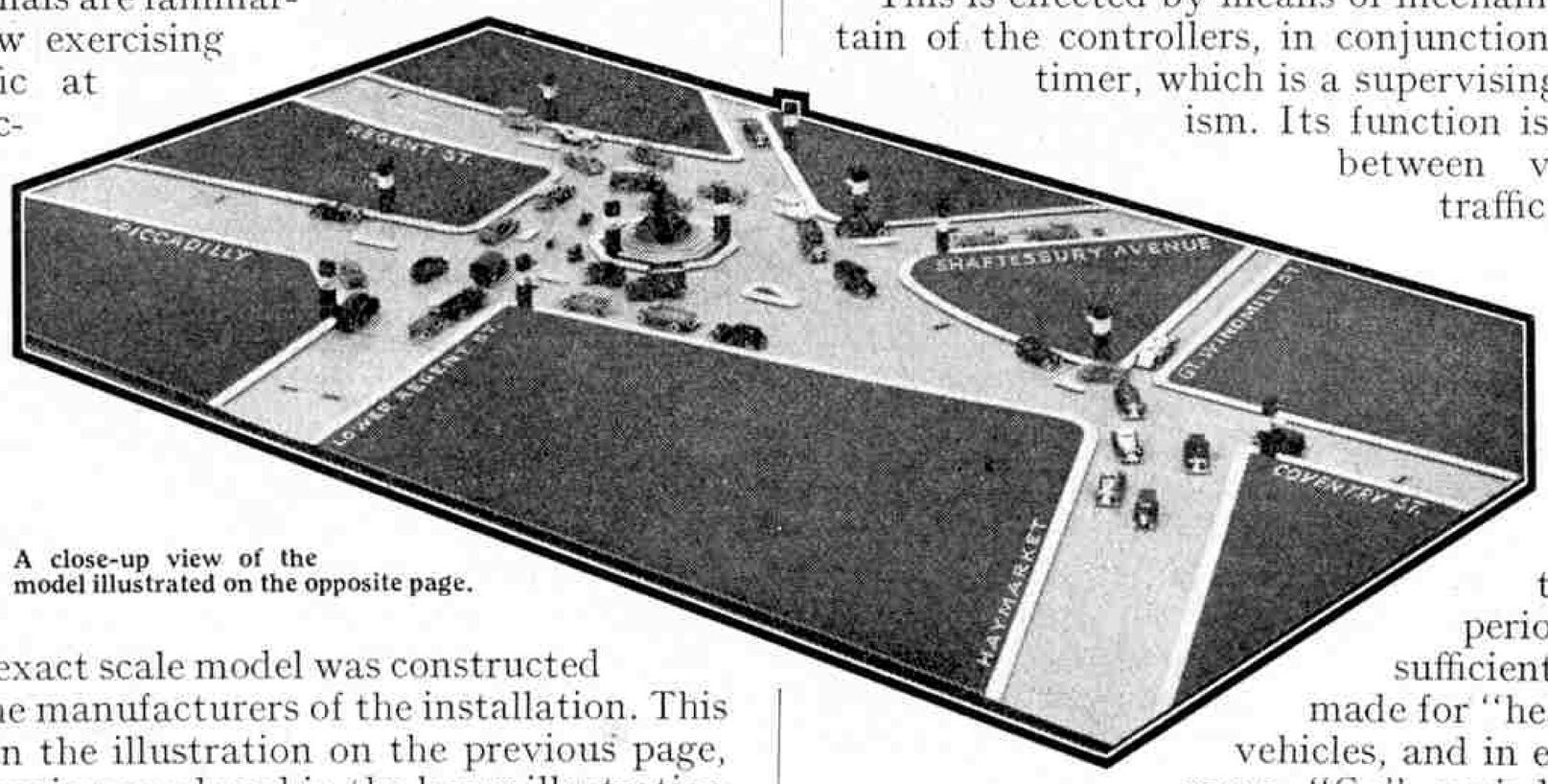
introduction of the Electro-matic signal lights it was considered one of the "black spots" of London traffic. Two factors contributed to these difficulties. One was the density of traffic, some 50,000 vehicles passing through the Circus during a normal day of 12 hours, with as many as 6,000 an hour in rush periods. The second was the geographical layout of the several intersections forming the complete area. This is very intricate, as a glance at the aerial view reproduced on this page shows. Nine streets form complex intersections in the area, and 15 policemen were necessary each day to provide constant control at nine points. Now these men have been replaced by three-colour light signals, which direct the streams of traffic accurately and carefully and maintain smooth, constant traffic flow throughout the Circus. In addition the Signals unerringly measure the density of the traffic, and adjust the time allowed for the right of way along certain roads in accordance with the density of the traffic.



An aerial view of the Piccadilly Circus area, showing the complicated network of streets controlled.

The actual equipment consists of 38 signal faces, with two special "Green Arrow" signals, 39 road pads or detectors, seven local controllers and a master timer. The system was set in operation on 15th November by Dr. Burgin, the Minister of Transport, who in the presence of a large crowd switched the master timer into operation. "*Eva*," as the signals are familiarly known, is now exercising control of traffic at this busy junction with complete success.

The preparation of a system of control for such a complicated area as Piccadilly Circus necessitated much care and thought. While it was in progress a large and exact scale model was constructed at the works of the manufacturers of the installation. This model is shown in the illustration on the previous page, and a close-up view is reproduced in the lower illustration on this page. The model had detector pads and traffic signals, and actually worked exactly as the real installation does. Dozens of Dinky Toys Motor Cars of various types were run along the miniature roads, and over the detector pads, in imitation of the main stream of traffic in the Piccadilly Circus area so as to provide a thorough test and demonstration of the working of the system.



A close-up view of the model illustrated on the opposite page.

The model was exhibited at the Public Works, Roads and Transport Exhibition, which was opened at the Royal Agricultural Hall, Islington, on the day when "*Eva*" began work at Piccadilly Circus. Visitors from all parts of the country derived much interest from moving the Dinky Toys Motor Cars over the road pads, and watching the response of the signal lights to the traffic demands they set up with this fascinating model.

The "Electro-matic" system solves the problem of traffic control at Piccadilly Circus by giving individual attention to every vehicle, and yet considering the needs of traffic volume in the Circus as a whole. Detector pads are placed in the various roadways, and every vehicle crossing one causes an electrical impulse to be transmitted to the controller. This controller contains electro-magnetic relay mechanism, which receives and "notes" every such message, and thereafter sends a further electrical impulse to the appropriate signal lantern, causing it to glow red, amber or green in accordance with the traffic circumstances.

In addition a recent important development known as "Density Control" is employed, and the use of this has a great effect in ensuring a smooth flow of traffic throughout the whole of the area. It is a development planned to consider individual vehicles as units in a traffic stream, and by gauging the density of that stream, to allocate an appropriate "right-of-way" period to it.

This is effected by means of mechanism located in certain of the controllers, in conjunction with the master timer, which is a supervising control mechanism. Its function is to seek for gaps between vehicles in each traffic stream, and to shorten the length of the green "Go" period allowed to that stream in accordance with the number and duration of these gap periods. A brief but sufficient allowance is made for "headroom" between vehicles, and in every instance the green "Go" period is sufficient to allow any vehicle to cross an intersection before cross traffic is released.

Each individual controller in the Piccadilly Circus area has its own local density control features, but those governing the intersections at Regent Street, Piccadilly and Shaftesbury Avenue are arranged to affect the cycle time set by the master timer. To prevent congestion in the Circus itself, as much consideration as possible is given by the density control feature

(*Continued on page 62*)

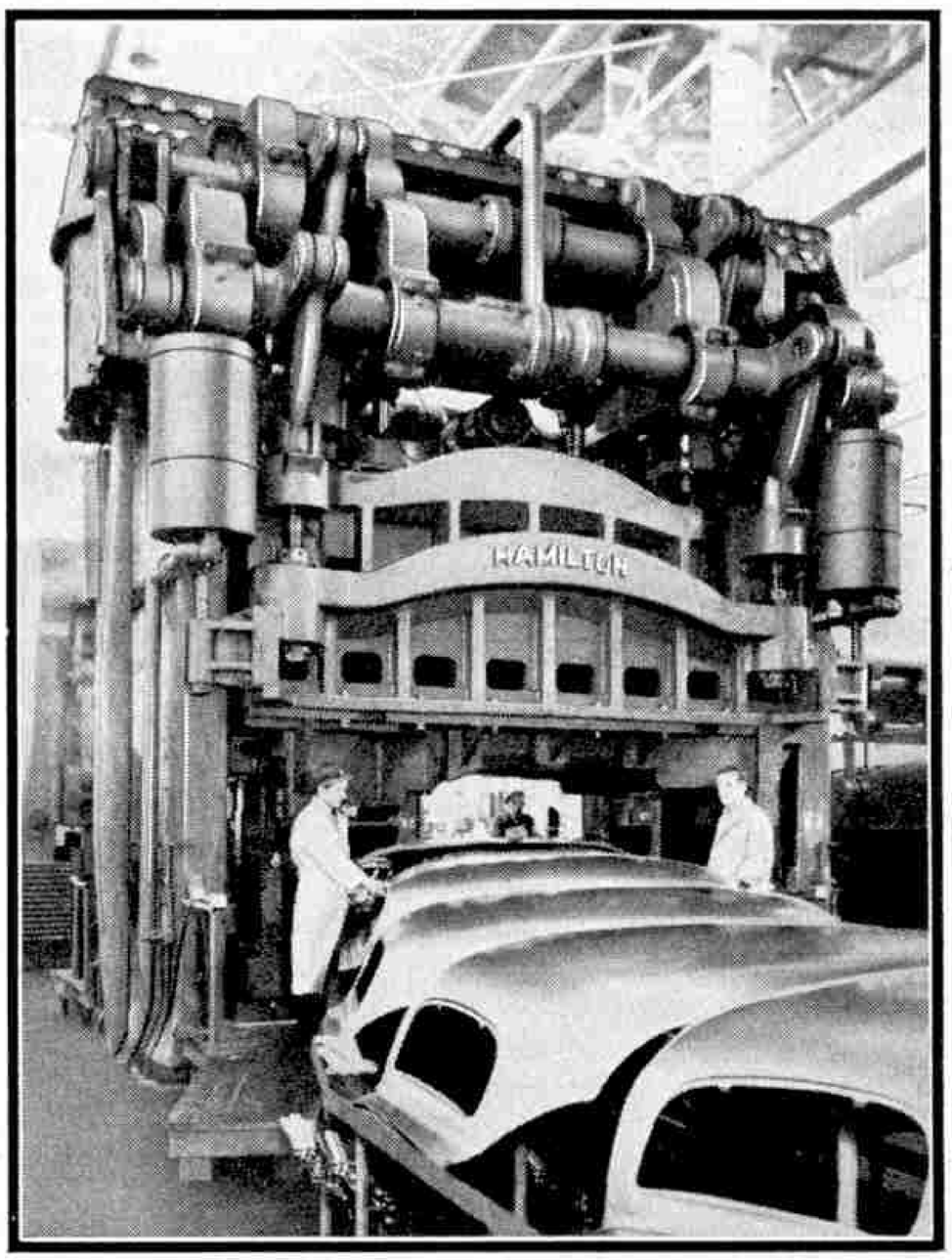
Hamilton Power Presses

Giant Machines Used in Making Steel Motor Bodies

ON page 446 of the "*M.M.*" for August last an account was given of the giant Hamilton press installed in the works at Sochaux of Peugeot Automobiles S.A., the famous French manufacturers of motor cars. The press is 36 ft. in height, and is installed in a pit so that it stands 26 ft. above ground. The force of its downward stroke is nearly 800 tons, and it is used for stamping out large sections required for steel motor bodies.

The advantages of giant power presses of this kind are so great that still larger ones have been constructed, and one of these is illustrated on this page. It is a Hamilton triple-action press of the latest design produced by the General Machinery Company, in the United States, and is shown stamping out in one action the roof section of a motor car body. Complete sections from the press are seen in the foreground. Each is complete, with the opening at the rear for the window, and in spite of the great size of the part it is produced in a single operation from the blank sheet.

Machines of this kind greatly speed up the production of motor car bodies. Large sections such as an entire side, the roof, or a complete door are made available for assembly, thus reducing the layout required for making the parts. In addition it is less costly to build up the bodies, because these can be constructed more quickly than if they consisted of many smaller parts.



Stamping out the roofs of motor car bodies with a Hamilton triple action press of the latest design measuring 15 ft. between uprights. Photograph by courtesy of the General Machinery Corporation.

The press illustrated measures 15 ft. between the uprights, and its total weight is nearly 450 tons. There are three moving slides carrying punches, one of them being below ground; and a complicated part can be pressed and drawn out to shape and pierced in one operation. The whole of the driving machinery, including the fly-wheel, the clutch and all gearing, is placed below the floorline in order to give the machine a very low centre of gravity. There is a certain amount of vibration with triple-action presses that have their heavy rotating parts mounted on the frame some distance above ground. The removal of these parts from the top of the machine to the position adopted in Hamilton presses reduces effects of this kind very considerably.

The introduction of larger power presses for the production of complete sides, roofs and other sections of motor car bodies has given rise to an interesting development in design. As the size of the parts to be made in one operation has increased, there has been a corresponding increase in the length and width of the moving slides and beds of the machines, between which the parts are produced. This has led to operating difficulties, particularly when parts that are not symmetrical are being stamped out. The greatest pressure may then occur on any point from the front to the rear edge of the slide. With the old style of press, in which pressure was applied to the centre of the slide, the result of this was tilting. The amount of clearance necessary to give a good running fit for the slide was sufficient to allow an objectionable amount of slide tilt.

In order to overcome this difficulty presses with twin shafts and four connections to the slide were introduced. In theory the power was then distributed to the four corners of the slide, and machines built on this principle are described as "four-point" presses.

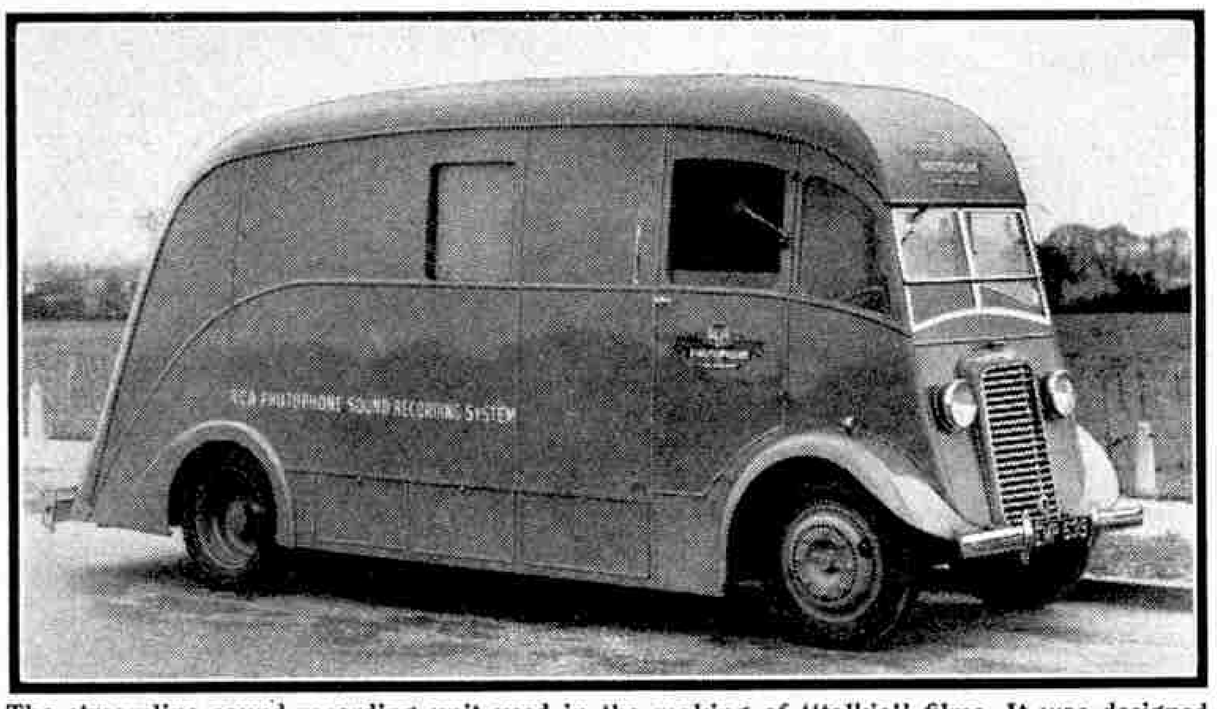
In practice even this did not prove sufficient, for tilting within the clearances limits was still possible when the centre of pressure did not coincide with that of the slide, but was in the marginal space outside the area bounded by the shafts transmitting the thrusts. The slide then had a tendency to rotate about the point of connection of one of the shafts, and the bearings and connections on that side were in compression, while those on the other were in tension. In the Hamilton presses the problem was finally solved by having the lines of the shafts outside the area of the slide. The centre of pressure is then always within the area bounded by the shafts, even if the loading is eccentric and one side is stressed more than the other. This solution is equivalent to the simple plan of supporting a beam at its ends instead of at other points along it, and has eliminated all possibility of slide tilting.

The first four-point presses making use of this principle were built at Hamilton more than seven years ago, and they have been followed by many others. One motor car body builder in the United States alone makes use of 20 of them, the smallest of which weighs more than 130 tons. Among other large presses built by the same company is a single-action double-crank machine that weighs 493 tons. It is used for forming the side members of large motor car frames. As the nature of the work suggests, the bed of the press is of immense size, yet it was cast in one piece and the casting was the largest of its kind ever produced in the United States.

Making Talking Films Outdoors

A Fully-Equipped Mobile Recording Unit

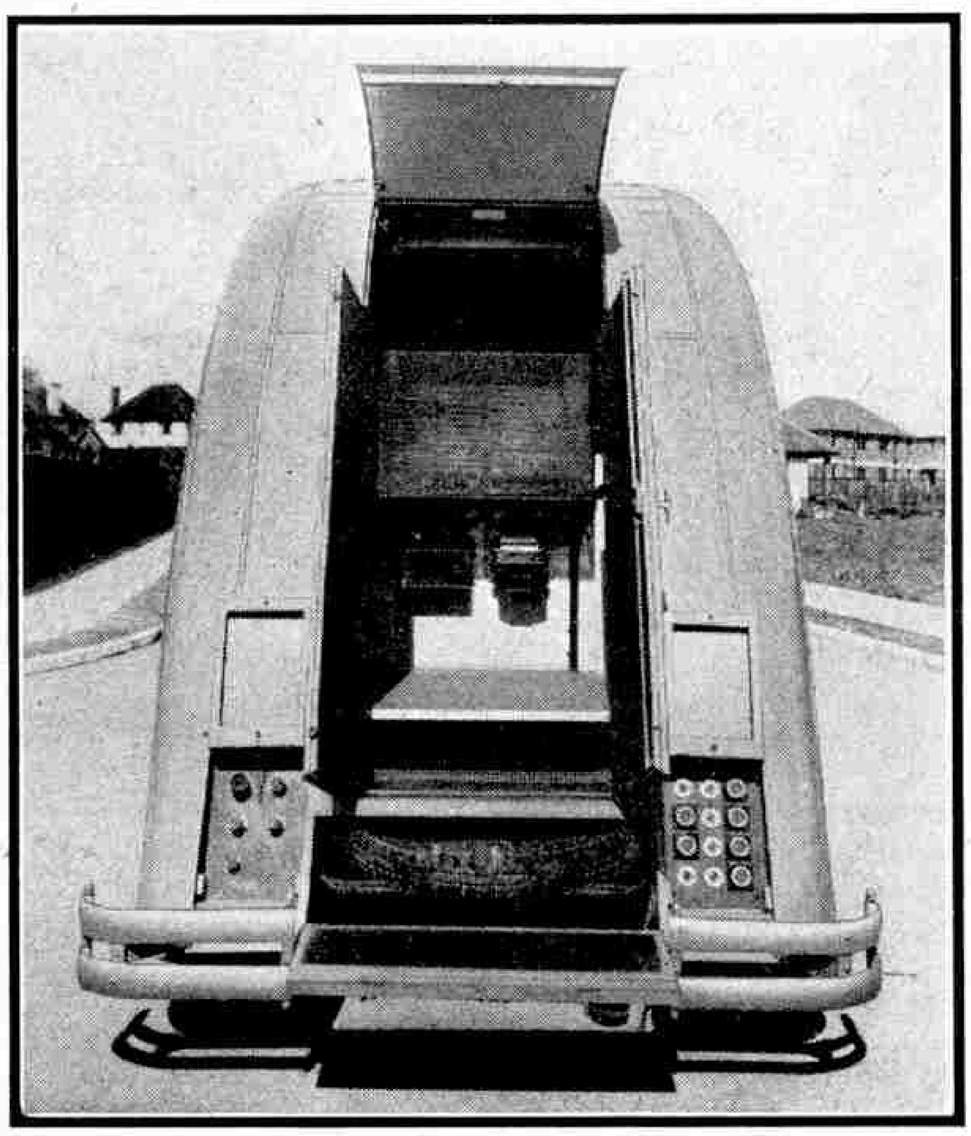
THE illustrations on this page show a new type of van designed by R.C.A. Photophone Ltd. for the purpose of housing apparatus for making sound films. This mobile unit has a modern streamline body, and contains within it all the complicated apparatus required for sound recording. It is so designed that it can be used either in the studio or out of doors; and is self-contained, the electric current required being obtained from accumulators, which can be charged when necessary by a generator driven by the engine.



The streamline sound-recording unit used in the making of "talkie" films. It was designed by R.C.A. Photophone Ltd., and is equipped for recording either in the studio or out of doors. The photographs on this page are by Wakefield Ltd., Chiswick.

The chassis of the vehicle is the Commer model N3, equipped for forward control, with the driver's compartment placed well forward over the engine. The body was designed and built by Gurney and Ewer Ltd., Ruislip, Middlesex, in conjunction with R.C.A. Photophone Ltd., and all the walls and roof are carefully soundproofed in order to prevent unwanted sounds from entering the van.

The layout of the interior of the van has been carefully worked out to secure efficiency and ease of operation. Four separate compartments are provided. The first is the driver's cabin, which contains the generator in addition to the driving controls. Directly behind it is a compartment known as the monitor room, which is entered through a door on the near side of the van. This contains an R.C.A. mixer console, the purpose of which is to enable the operator to control the output of each microphone in use for picking up the sounds to be recorded. With it he can combine the outputs of several microphones if desired, at the same time regulating the volume of each one until the required acoustic balance is obtained. The console is so mounted that when necessary it can readily be removed from the monitor room and placed on the set, where the operator can view the action while recording. To the left of it is a loudspeaker, the sound from which guides the operator when monitoring or control work is being carried out in the van, and beneath this is a cabinet containing microphones, camera motors, and spare parts.



A rear view of the R.C.A. recording unit, showing the plug panels for the exterior cables and microphone connections.

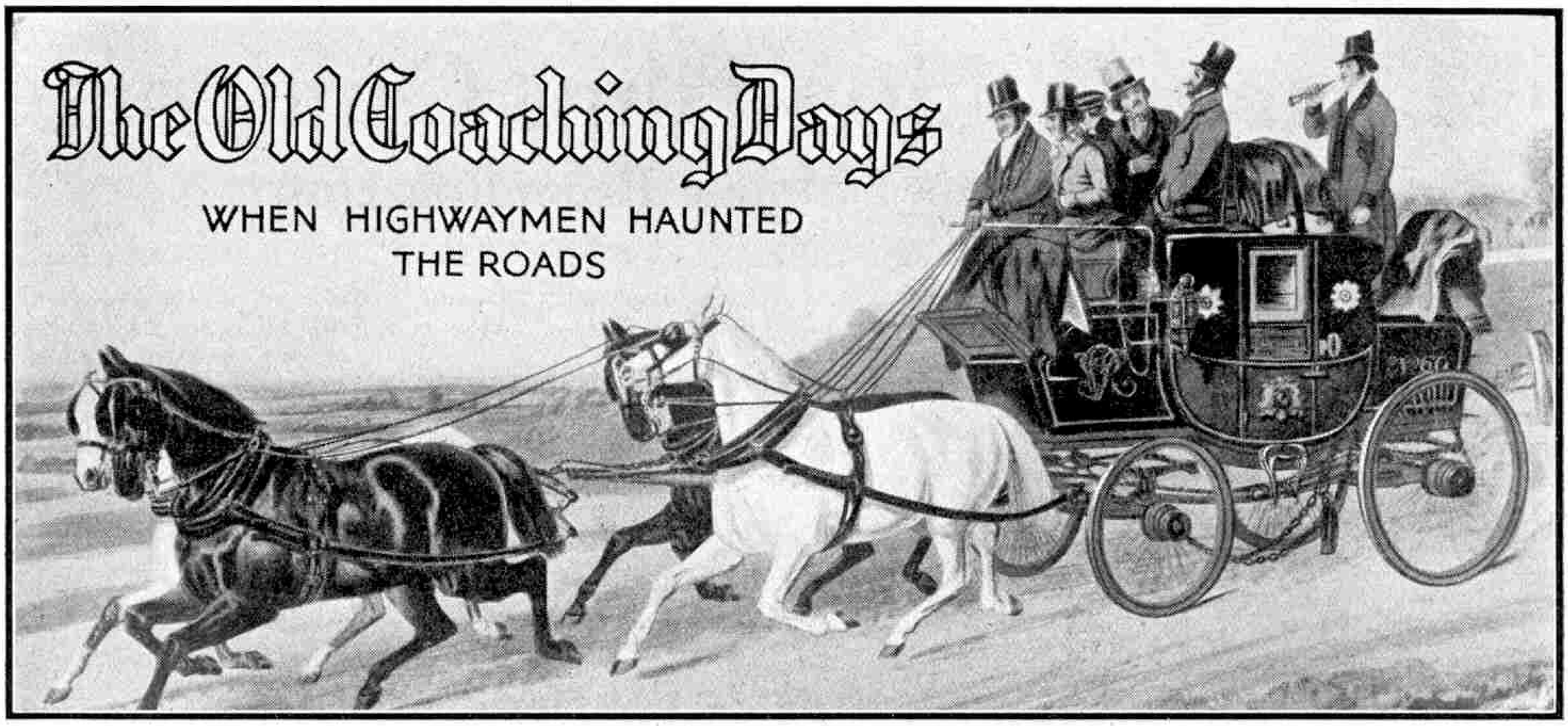
Behind the monitor compartment is the recording room. In this is the amplifier by means of which the electrical energy obtained from the microphones is increased to the stage required for feeding to the recorder, together with the recording apparatus itself. As the record is made on sensitive film, daylight must be excluded when recording is in progress, and the room therefore is so constructed that it can be made entirely lightproof by closing the window on the near-side of the van and the door communicating with the monitor compartment. A suitable red light is provided for use when loading film and making film tests. In this compartment also is the power control panel, from which all the power supply of the van is regulated.

The fourth compartment of the van, which is entered from the rear, is used to house the power equipment and cables. From it access is given to the back of the power control panels, and the accumulators that supply current for operating the recording equipment are installed in lockers placed between the front and back wheels on both sides of the van.

Although when on outdoor, or location work, as it is called, the van has an independent power supply of which it can make use and is thus entirely self-contained, it is also designed to operate off an external supply when used for interior work at the studio. In this case the supply current is fed to the van by cables plugged into panels provided on each side of the step at the rear. These panels are used also for making connections between microphones, cameras, the mixer console and other parts of the apparatus. In addition to the accumulator charging facilities provided by the generator operated off the engine, charging can be carried out from an external alternating current supply.

The Old Coaching Days

WHEN HIGHWAYMEN HAUNTED THE ROADS



IT was not until the last quarter of the 18th century that mails were sent over the roads of England, Wales and Scotland by stage coach. Before then they were carried by carts. As the coaches travelled much faster, it became a common practice to do up urgent letters as parcels, and to give them into the care of the coach guard for transmission.

An agitation for the establishment of coaches to carry mails was begun by John Palmer, a theatre proprietor of Bath. He described the post-boy of the day, perhaps with some exaggeration, as an "idle boy without character, mounted on a worn-out hack, who, so far from being able to defend himself against a robber, was more likely to be in league with one."

Palmer's scheme was supported by Pitt, then Chancellor of the Exchequer in the Shelburne Ministry, but it was not until after the fall of both that Ministry and the Coalition that followed that the plan was carried out by Pitt himself, as Prime Minister.

The first mail coach ran on 2nd August, 1784, from Bristol to London. It completed the distance in 17 hours. The system was a success, and in consequence it was soon extended to other roads.

In 1837, the last unbroken year of the mail coaches starting from London, 21 coaches were leaving the General Post Office regularly.

In 1838 there were still some 180 coach services. These included 59 four-horse mails in England and Wales, 16 in Scotland and 29 in Ireland, in addition to over 70 pair-horse services. It was in this year, with the novelty of railways creating a desire for fast travelling, that the Post Office yielded to the cry for speed. Abandoning its usual conservative attitude, it decided to increase the speed of its horse coaches, but it overstepped the bounds of safety. For some time mails were run to clear 11 m.p.h., which meant an average pace exceeding 13 m.p.h. These were popularly called the "calico mails" because of their lightness. These faster mails met with so many accidents, however, that cautious folk began avoiding them, preferring the more orthodox services at a speed of 10 m.p.h.

The times of some of these stage coaches are worth recording. The night coach from London to Holyhead took 27 hours; to Falmouth 29 hours; to Edinburgh 43 hours; and to Thurso 108 hours.

The business controlled by at least one of the old coach proprietors would make even the modern mail-van contractor feel envious. In 1832 a certain William Chaplin owned 3,000 coaches and 150,000 horses, employed 30,000 drivers, guards and ostlers, and ran 27 mail coaches every night out of London.

A mail coach of bygone days arriving at an inn. The illustrations to this article are reproduced by courtesy of the Post Office.

A coach trip was an exciting adventure. It was almost an everyday occurrence for the mail bags to be robbed. The following notice issued to mail guards in March 1802 gives some indication of the conditions under which these journeys were undertaken: "Three Irishmen are in custody for highway robbery. One of them has confessed, and declares that their purpose in going out was to rob the mail coach. Their first step was to watch an opportunity and fire at the guard, which it is supposed might have been easily obtained, as they are so frequently off their guard. They had pistols found on them. It is therefore necessary, in addition to your former instructions, to direct that you are particularly vigilant and watchful, that you keep a quick eye to every person stirring, and that you see your arms are in the best possible condition and ready for instant duty."

Probably the guards returned these instructions with the usual "noted for attention," but the record does not say.

This is a copy of another circular issued to the guards:

"£200 Reward

"Huffey White is strongly suspected to have been concerned in the robbery of the Leeds mail, between Kettering and Higham Ferrers, on Monday evening, October 26th, 1812; whoever shall apprehend, or cause him to be apprehended, will be paid a Reward of £100 upon his commitment for trial, and the further reward of £100 upon his conviction.

"Huffey White is a native of London, by trade a cabinet-maker, about 35 or 36 years of age, of good appearance, stoutish made and stands very upright, has thin legs, brown hair, broad or full forehead, pale complexion, light grey eyes and little eyebrows, is marked with small-pox and his nose turns up. He has a squeaking voice, is mild in manners, and does not talk much. He is well known at all police offices.

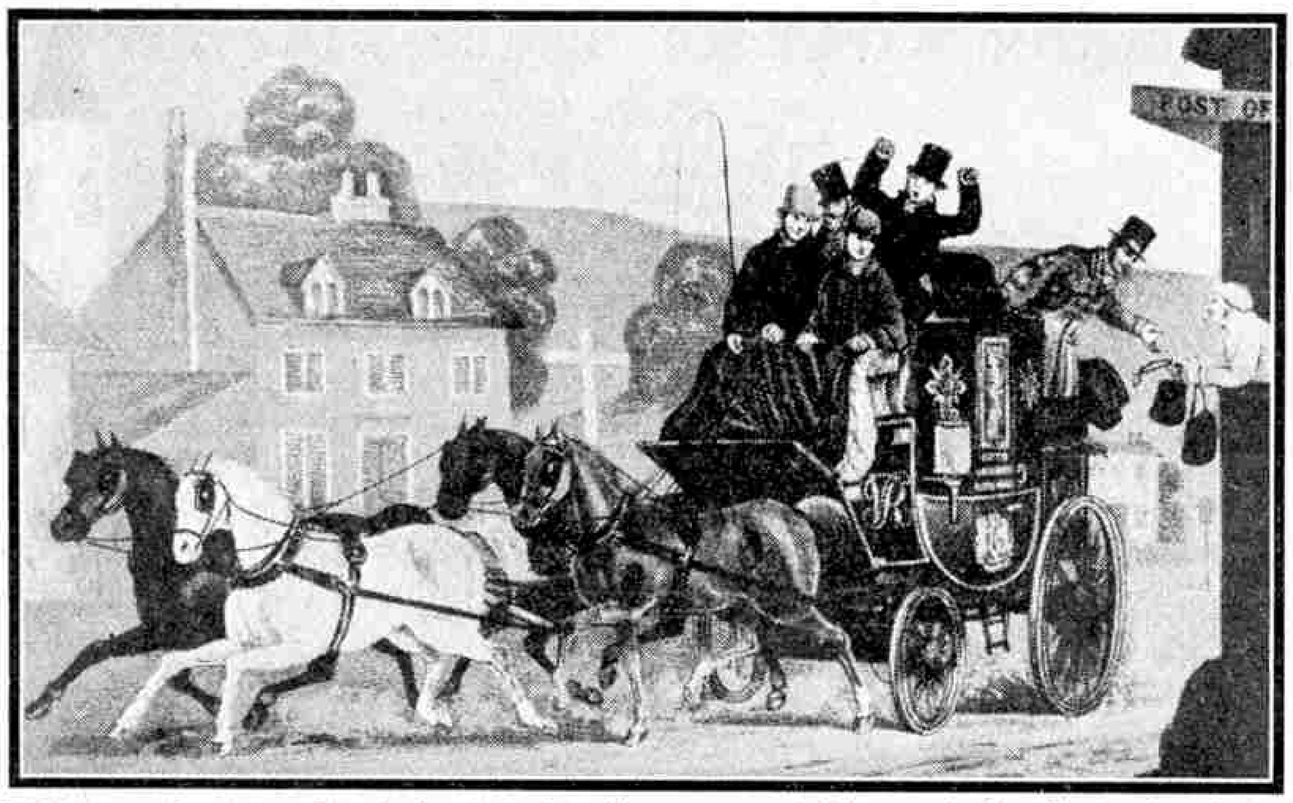
"He had formerly served some years on board the 'Hulks' and returned some ten years since.

"About four years ago he was capitally convicted at the Old Bailey, and ordered to be transported for Life, but afterwards made his escape.

"About twelve months after his conviction he was apprehended at Stockport, and tried and convicted at Chester Assizes for his escape. He was sent back to the 'Hulks,' but again escaped.

"He afterwards robbed the Paisley Union Bank, and immediately proceeded to London by way of Edinburgh, in Post Chaises; and in two or three days after his arrival, was caught in Surrey. At Kingston Lent Assizes he was tried and convicted and again sent to the 'Hulks.'

"From thence he again escaped, and has since been in the counties of Cambridge, Huntingdon and Northampton, passing by the name of Wallis, until the robbery of the Leeds mail in October last."



Mails were picked up without stopping when they were carried by coach. Our illustration shows an exchange being made at a wayside post office.

Had these old guards an association to guard their interests it seems likely that application for a "risk allowance" would have been made! But they were a motley crew. Each received but 10/6 a week from the Department and a uniform of trousers, top boots, scarlet coat and a gold-banded black tall hat with a cockade. Out of their pay they had to provide for the cost of oil in the hand-lamps in front of their seats, to pay for the cleaning of tools, blunderbuss and pistols, and to perform a variety of odd jobs that cost five shillings a week out of their own pockets. What remained of the half-guinea was hardly worth having, but they expected to make from tips at least half a crown from each inside passenger and two shillings from the outside ones.

A "good mail" would produce as much as £300 to £500 a year from tips and fees for services rendered.

The duty of a mail guard, besides the primary one of protecting the mails, for which he was provided with a blunderbuss, a pair of pistols and a cutlass, was to see that time was kept according to the official time bill. The Post Office furnished its guards with a clock enclosed in a leather pouch. These clocks were regulated to gain or lose so many minutes in 24 hours according to the direction in which the coach travelled, in order that local time might be kept during the run.

Snow storms were a real terror of the roads in these times. A storm at Christmas in 1836 deranged practically the whole of the coach service throughout the country. On some of the roads the coaches simply had to be abandoned. The mail proceeding from Exeter to London was five times buried in the snow, and had to be dug out. A mail coach got off the road seven miles from Louth and went over into a gravel pit, one of the horses being killed. So deeply was another coach buried on this road that it took 300 men, principally miners, working several hours, to make a passage to the coach and rescue the mails and passengers. Near Chatham the snow lay to a depth of 30 ft., and 400 soldiers were turned out to clear the roads.

On the Dover road over £700 was spent clearing the snow, an official report stating that for 26 miles the road "was blocked up by an impenetrable mass of snow varying from 3 ft. to 18 ft. in depth."

100 GUINEAS REWARD.

GENERAL POST-OFFICE, 16th July, 1827.

WHEREAS on the Night of Thursday the 12th Instant, about a Quarter-past Ten o'Clock, the Driver with the Mail between Leatherhead and Dorking, was feloniously stopped by two Men on the King's Highway, between Leatherhead and Dorking, opposite Givon's Grove, when the Men fired two Pistols at the Driver, and severely wounded him.

The Men are stated to have been dressed in dark Clothes.

WHOEVER will come forward and give such information as may lead to the apprehension and conviction of the Offenders, shall receive a Reward of

One Hundred GUINEAS.

A Ramrod was found near the spot, and is supposed to have dropped from the Pistol of one of the Offenders.

If either of the Persons concerned in the said Felonious Attack, or any Person knowing thereof, will surrender himself, and make discovery whereby the other Offender or Offenders may be apprehended and brought to justice, such Discoverer will be entitled to the said Reward, and will also receive His Majesty's most gracious Pardon.

Poster evidence of the activity of highwaymen in coaching days.

Between Leicester and Northampton cuttings just wide enough for a coach to pass were made, where the snow was heaped up to a height of 30, 40 and in some places 50 ft. At Dunchurch, near Coventry, 17 coaches were snowed up.

Moses James Nobbs, one of the last of the guards, wrote the following account of his experiences during this storm: "After leaving Salisbury the snow came down so thick and lay so deep that we were brought to a standstill, and found it impossible to proceed any further. Consequently we had to leave the coach and go on horseback to the next changing place, where I took a fresh horse and started for Southampton. There I procured a chaise and pair, and continued my journey to Portsmouth, arriving there about 6.0 p.m. the next day. I was then ordered to go back to Bristol. On reaching Southampton on my return journey, I found the snow had got much deeper, and at Salisbury I found that the London Mails had arrived, but could proceed no further, the snow being so very deep. Not to be done, I took a horse out of the stable, slung the mail bags over his back, and pushed on for Bristol, where I arrived next day, after much wandering through fields, up and down lanes, and across country—all one dreary expanse of snow. By this time I was about ready for a rest, but there was no rest for me in Bristol, for I was ordered by the Mail Inspector to take the mails on to Birmingham as there was no other Mail Guard available. At last I arrived at Birmingham, having been on duty for two nights and days continuously without taking my clothes off."

In 1852 Nobbs was in charge of the Cheltenham-Aberystwyth coach and relates further adventures during the disastrous floods of that year.

"The rivers were so swollen," he reported, "particularly the Severn and the Wye, that it was difficult to get along the roads. Leaving Gloucester at midnight on one occasion, all went on well until the coach reached Lugg Bridge, four miles from Hereford, or rather the place where the bridge had been, for it had been washed away in the night, and the coach, going along quickly, fell into the rushing stream. Horses, coach and coachman, the guard and one passenger were carried down the river about a mile and a half. The coachman caught hold of one of the leaders which had broken loose, and he and the horse were carried some distance and washed into a field, where the animal was able to regain its footing. The other three horses were drowned. The guard and the passenger managed to catch hold of a tree as they floated down stream, and they were rescued after being some hours in the water, but unfortunately the passenger died some days after from the effects of his immersion.

"On the following night I had a very unpleasant experience of the flood. Coming within a mile and a half of Gloucester, we found the water had risen considerably since the morning; so much so that the coachman would not venture to proceed unless someone went first to see what was the depth. I got down and walked about a hundred yards, with the water up to my armpits, and called to them to come on, which they did; but, unfortunately for me, they did not stop to pick me up, and there I was left for full three hours on a dark night in the water, surrounded by it on all sides, and afraid to move one way or another for fear of getting out of my depth. At last, almost in despair, I did make an effort, and with great difficulty managed to get to Gloucester, where I was put to bed between warm blankets."

The opening of the first railway in 1830 meant the commencement of the end of such adventures as these and the gradual decay of the coach services. The last of the old London mail coaches arrived from Norwich and Newmarket on 6th January, 1846.

In 1837, the year of Queen Victoria's accession, 52 Mail Guards were appointed by the Postmaster General; in 1840 there were 19; and in 1843 the number fell to one.

"The end of the coaching age," wrote C. G. Harper in his fascinating book, "*Stage Coach and Mail in Days of Yore*," from which some of the foregoing details have been gleaned, "was a tragedy for the coachmen; and even to many others, whose careers and livelihood were not bound up with the old order of things, it was a bitter uprooting of established customs."

We are indebted to the courtesy of the Editor of the "*Post Office Magazine*" for permission to reproduce this article.

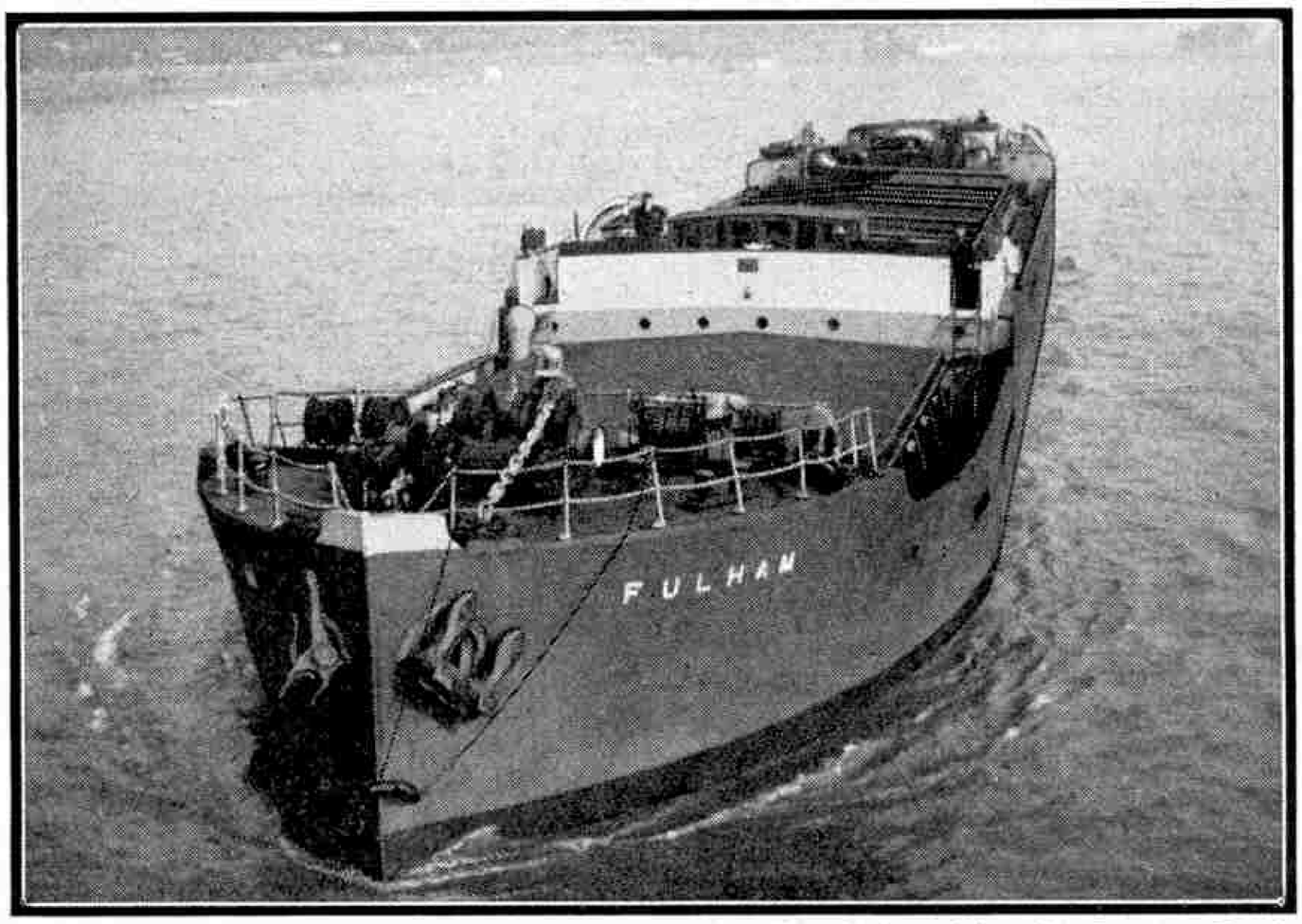
London's Collier Fleets

Bringing Coal for Light and Power

By W. Philip Conolly

DURING every week throughout the year an average of nearly 120 ships enter the Thames, bringing cargoes of coal from Scottish, North East coast and South Wales ports. In 1936 a total of 6,031 vessels, having an aggregate registered tonnage of 5,209,797, brought coal to London as domestic, industrial, bunkerage, power station and gasworks supplies. These ships range in size from the small motor coasters about 150 ft. in length to the steam colliers approaching 250 ft. overall, built for working "above bridges" in supplying the various riverside gasworks and power stations.

In the lower river will be found the large colliers of four or five thousand tons or more, which carry coal to all parts of the world. These bring much of the bunkerage and industrial fuel, and in many cases these types of coal are unloaded over the ship's side into barges that are towed up river to the numerous wharves and depots. Domestic coal does not amount to a great proportion of the total brought to London by sea; most of this class comes to London by rail. The colliers working on regular passages to the London power stations provide the main interest.



The steam collier "Fulham," owned by the Fulham Borough Council, inward bound at Battersea Reach. The vessel in this illustration, and that in the upper one on the opposite page have their funnels lowered to enable them to pass under bridges.

Coal has been shipped to London since the days of Henry III. It was the "sea-coal" that Queen Elizabeth ineffectually tried to ban the use of, owing to its being the cause of the murky atmosphere in the London of her time. Previous to the introduction of steamships as colliers, coal was conveyed in sailing vessels of the type known as "brigs," this name being a contraction of "brigantine." These ships were known as "Geordies"—their steam successors have acquired the less picturesque nickname "flatiron"—and it is of interest to note that they perhaps contributed more to the success of the steam tug than any other vessel. For weeks together, the wind remaining easterly, numbers of colliers became wind-bound in the Tyne, unable to put to sea, while coal prices in London soared as the fuel famine became more severe. At such times a powered vessel was a godsend in getting the ships out to sea, setting them on their journeys south. The "Geordies" were a direct incentive towards early tug construction.

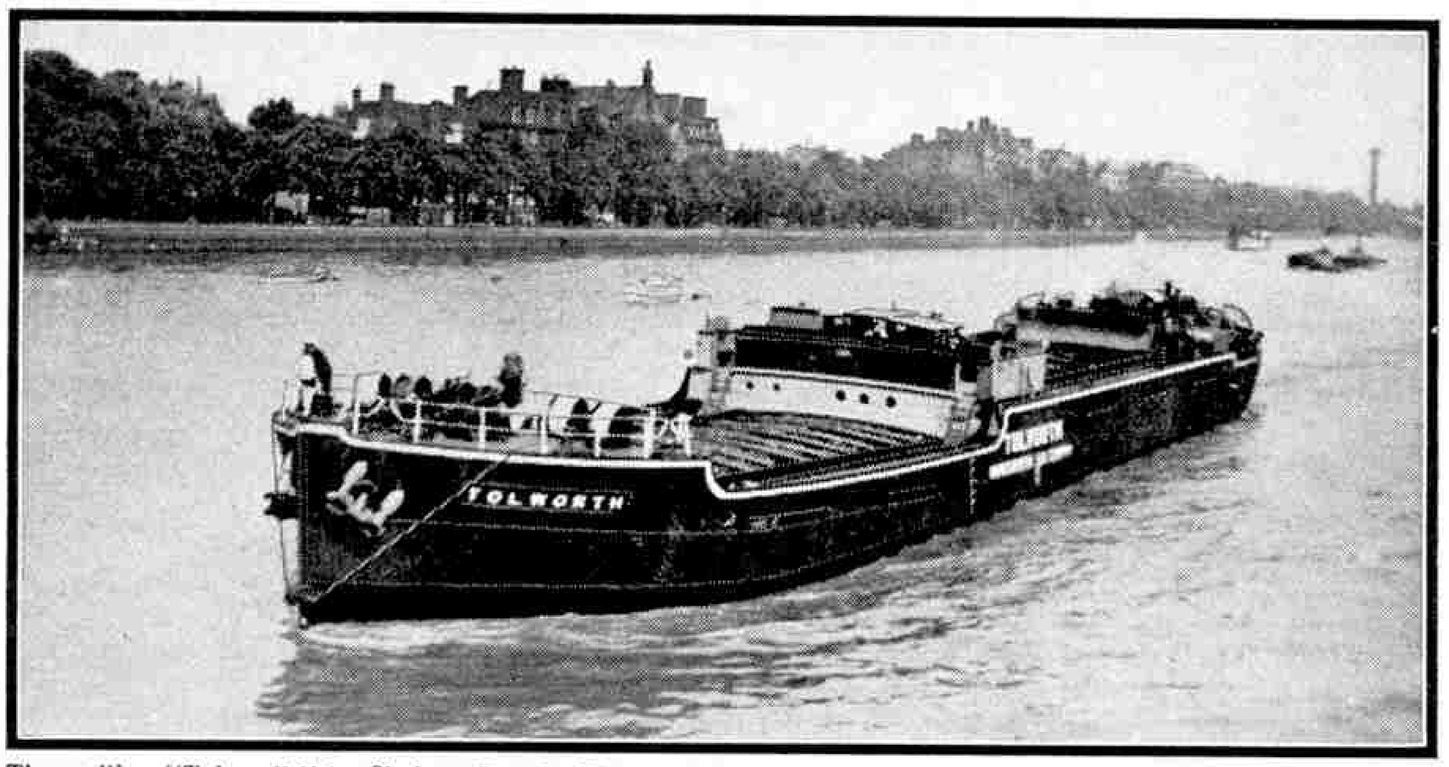
As the nineteenth century industrial expansion began, demanding speedier and more economical passages, the "Geordies" had to give way to powered craft, and experiments were undertaken with a view to the introduction to the trade of specially built steamships. The year 1844 saw the first attempt to effect this, in the placing in service of the steamer *"Q.E.D."* This iron-built vessel, which admittedly was an experiment, was barque rigged and had a screw propeller driven by a 20 h.p. engine, giving her a speed of approximately four knots. To-day she would be known as an auxiliary, for most of her work was done under sail. She was 150 ft. in overall length and 27 ft. 6 in. in beam, and carried a load of 340 tons of coal. She is said to have been the first vessel fitted for water ballast, the water being admitted through taps and pumped out by the ship's engine. After four years the engine of the *"Q.E.D."* was taken out, and she was rigged as a barquentine.

The first true steam collier was the *"John Bowes,"* built at Jarrow, on the Tyne, eight years later, by Palmers the shipbuilders, who were themselves interested in the coal trade. This vessel's principal dimensions were length 167 ft., breadth 25 ft. 7 in., and depth 15 ft. 6 in. She was of 270 tons register, could ship approximately 650 tons of coal, and had a speed of about nine knots. Tanks for extra water ballast were installed for use when she worked back to the Tyne in an unladen condition. Apparently this vessel was quite successful, for she had a long life, being in existence, although in a much altered form, 60 years after her launching.

The collier, built to work "above bridges," must be compact in design, with an entire absence of unnecessary superstructure, so that she can negotiate the restricted clearances of the bridges, perhaps 17 of them, through which she may work. Length is usually between the limits of 220 ft. and 245 ft. The six ships of London's newest fleet, working to the new Fulham Power Station, were built at Sunderland at a cost of £30,000 each. Their dimensions are length 245 ft., beam 38 ft. 3 in., and depth 18 ft. 6 in. Carrying nearly 2,300 tons of coal, their loaded draught is about 16 ft. These ships, with their green and grey hulls and buff upperworks, maintain a strictly

regular service to keep pace with the power station's consumption of more than 1,000 tons of coal per day. Their speed is about 10 knots, and they take 30 or 40 hours per passage, dependent upon how far north they go, perhaps to Leith.

The collier is a three-island type of ship, having an elevated forecastle, which gives a certain amount of protection in head seas and on which is mounted the anchor gear. Next comes the first well deck with hatchway leading to the forward hold; then the bridge deck, followed by the second or after well deck and its number two hold and hatchway. Finally, the poop situated aft takes the funnel, boats and davits, ventilators, and hand steering gear.



The collier "Tolworth" in Chelsea Reach. This vessel is owned by the Wandsworth and District Gas Company and regularly carries coal to Wandsworth, the highest point up river reached by colliers, 54 miles from the Nore.

Boilers, engines, bunkers, crew's accommodation, etc., are all arranged in the after end of the ship, and as the funnel is placed aft, an unobstructed two-thirds length of ship is available for rapid loading and discharge, giving the berth cranes an unrestricted radius of action. The funnel, which must be lowered to negotiate the bridges, is hauled down by a steam winch placed right in the ship's stern. Orders for lowering it are transmitted from the bridge to a telegraph instrument similar to that used for the engine room. Sometimes the funnel is flatsided rather than circular in section, in order that it shall not require too great a clearance. Ventilator cowls also are hinged, and they are laid flat when Tower Bridge is passed, on the way up river.

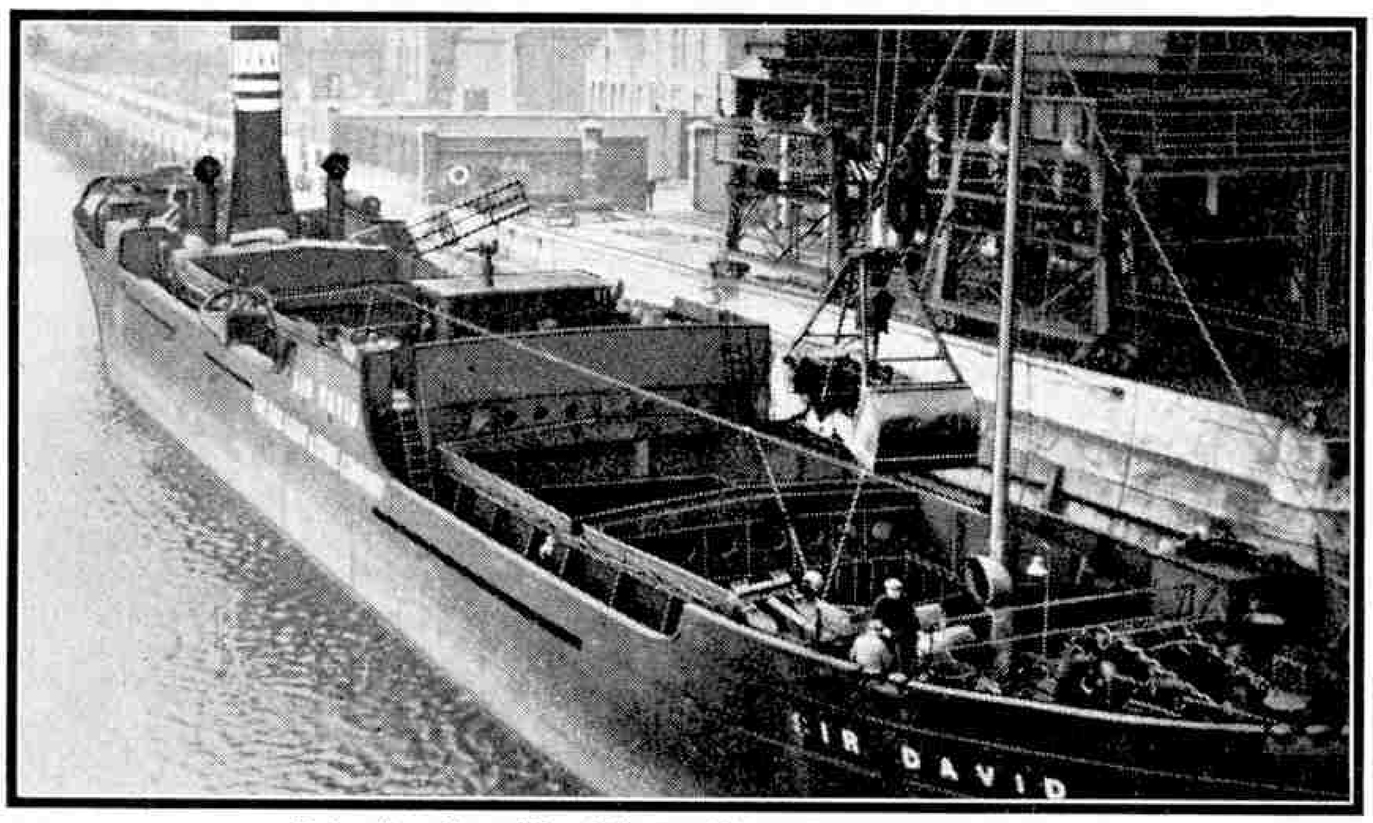
The ballast tanks and their pumps are important features in the collier, as she has to make each return trip in an empty condition. When outward bound from London, usually leaving the berth in the upper river about three hours before high water, the tanks are only partially filled to avoid the possible stranding that would take place with too deep a draught. When the Pool of London is entered the tanks can be filled and the vessel trimmed for her voyage.

On the southbound trip, laden, the coal is trimmed almost to the hatches, and one frequently sees the holds uncovered as the vessel comes up the river, ready for immediate work as soon as she berths. At Fulham the coal can be unloaded in as little as 6½ hours if necessary, but as the ship must await the next flood tide before she can leave, rather more time is usually taken for discharge.

Navigation so far up river with a ship nearly 250 ft. in length is no easy job, and every factor must be taken into account, such as wind direction, strength of tide, etc. One of the most difficult bridges to work through was the recently-dismantled Waterloo Bridge with its restricted arch spans and its situation on a bend of the river. Not only was the view up or downstream obstructed, but the set of the tides towards the north bank also complicated matters.

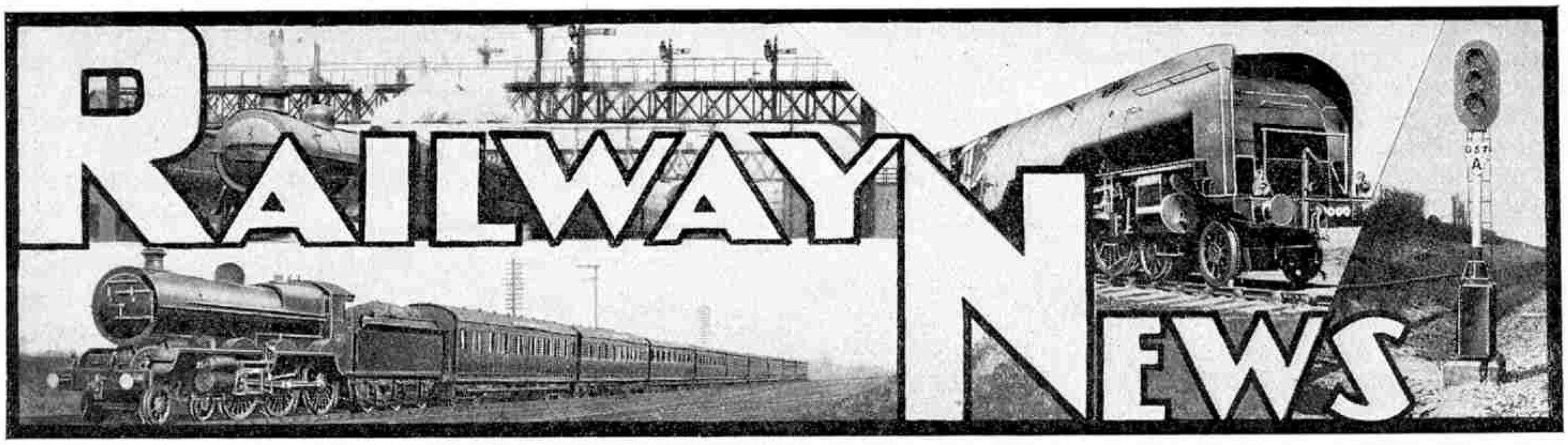
The collier's farthest point reached up river is at Wandsworth, 54 miles from the Nore, and here come the three vessels *"Ewell," "Tolworth"* and *"Wandle."* During 1936 these ships made an average of 66 voyages each, bringing in all 376,283 tons of coal to the station. To this fleet will shortly be added a fourth ship of 2,400 tons deadweight, now under construction at Burntisland. She will be named *"Wimbledon"* and is expected to be in service for the Wandsworth and District Gas Co. by the end of 1937.

Within half a mile downstream from the Wandsworth Berth is the Fulham Power Station jetty. This jetty, 360 ft. long, gives accommodation to two colliers simultaneously, and has three travelling cranes each capable of unloading 175 tons per hour. The reserve coal dump here contains 50,000 tons. Another berth, at Fulham Gasworks, is situated a few hundred yards farther on. At Battersea Power Station, a mile down river, another jetty takes two colliers at once. Nine Elms Gasworks provide the last berth above London Bridge. In the lower river are several berths and jetties, at Beckton, Barking, East Greenwich, etc.



Unloading the collier "Sir David" at Fulham Gas Works.

The 30 or more colliers working to the upper river are nearly all managed by a Newcastle firm of shippers, for their respective owners. The crews also are mainly Newcastle men. Eighteen ships are owned by the Gas Light and Coke Company, the newest vessel in this fleet being *"Mr. Therm."* This ship and the *"Fulham"* represented their type at the Coronation Naval Review at Spithead last year. Some of the 15 ships owned by the same managers at times visit London on charter, when the vessels belonging to the London power and gas companies are undergoing repairs or overhaul.



Notable Midland Test Runs

Remarkable performances were made recently by a standard 4–6–0 three-cylinder locomotive of the 5XP "Jubilee" class during dynamometer car trials over the Midland and Northern Divisions of the L.M.S. These runs were made in each direction between Bristol and Leeds, and between Leeds and Glasgow, with a view to possible future accelerations on the routes concerned.

On these trials a nine-coach train, including the dynamometer car, was employed throughout. The empty weight was 302 tons and the engine on all the tests was No. 5660 *"Rooke,"* which is fitted with a speed-indicator. The schedules laid down were of an accelerated character, and various special speed restrictions were imposed; but even so the aggregate gain to the engine amounted to 88¼ min. over existing timings.

The outstanding feature of the trials was undoubtedly the Carlisle to Leeds run on the return journey from Glasgow. In 48½ miles the line rises from near the sea level at Carlisle to 1,167 ft. above it at Ais Gill summit; yet to the latter point an average of almost 60 m.p.h. was made. After Ormside there is a virtually unbroken 15-mile climb, largely at 1 in 100, which was covered in 16 min. 15 sec., with a final minimum speed of 46½ m.p.h. on the 1 in 86 gradient before the summit. This exceptional effort took the train past Ais Gill summit, 48.4 miles, in 48 min. 36 sec., compared with the test schedule of 59 min., and with a fastest regular timing of 64 min. Leeds, 113 miles, was reached in 116 min., compared with the test schedule of 125 min. This was achieved with no higher maximum speed than 76 m.p.h., and with three permanent way and several service slacks.

The enginemen concerned in the tests were Driver E. Gardner and Fireman P. R. Hook, of Bristol, between Bristol and Leeds; and Driver W. North and Fireman H. George, of Leeds, from Leeds to Glasgow and back.

New Boiler for *"Princess Elizabeth"*

L.M.S. No. 6201 *"Princess Elizabeth"* now has a domeless boiler. We understand, however, that the domed boiler with separate top-feed will be restored when the engine next visits the shops.

Christmas Traffic at King's Cross

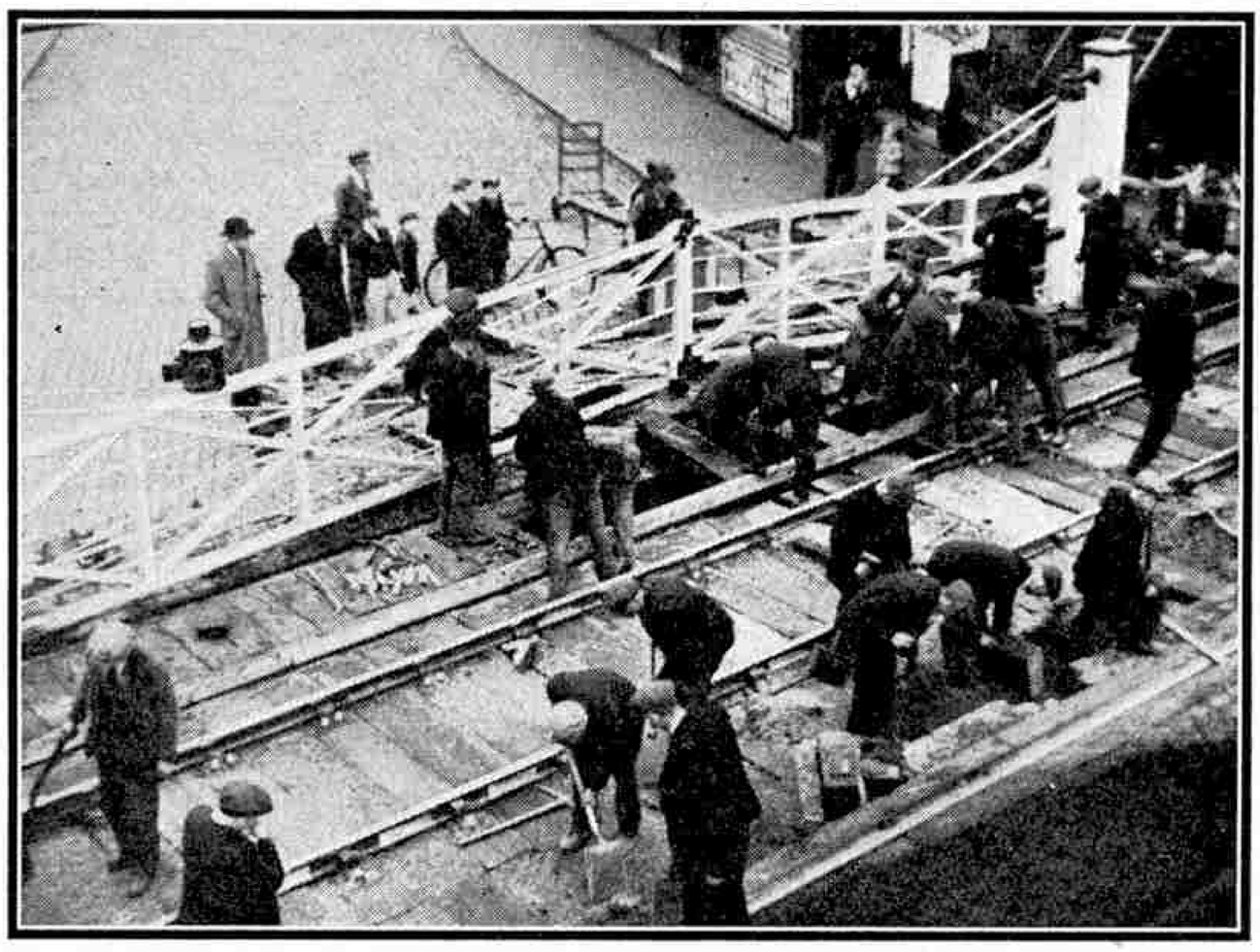
An entirely new departure in train operation was made by the L.N.E.R. during the recent Christmas holidays. In previous years several "relief" trains were run in the peak period, but passengers still showed preference for travelling by the main trains, thus making them overcrowded while the "reliefs" were comparatively lightly loaded. To overcome this difficulty various "reliefs" served different stations and omitted intermediate stops so that passengers were more evenly divided over the trains and were able to enjoy non-stop runs.

This arrangement necessitated the revival of the longest non-stop run in the world, ordinarily made during the summer only. On Thursday, 23rd December, a relief train to the 10.0 a.m. *"Flying Scotsman,"* which calls in winter at Grantham, York, Newcastle and Berwick en route to Edinburgh, was booked to leave King's Cross at 9.30 a.m. and to run non-stop to Edinburgh.

Christmas Holiday special trains began as early as Thursday, 16th December.

Speedometers for G.W.R. Locomotives

As the result of experience gained from fitting speedometers to locomotives of the "King" and "Castle" classes, the G.W.R. have now decided to equip also engines of the "Star" and "Saint" classes.



A busy scene at a level crossing at Altrincham showing the paving of the crossing being removed to allow of the renewal of the track. Road and rail traffic was diverted during operations. (H.R.C. Prize-winning photograph by S. Garbutt, H.R.C. No. 30722, Timperley.)

New L.N.E.R. Coaches in 1938

The L.N.E.R. are to carry out an extensive programme of renewal of passenger rolling stock this year. Some 730 new vehicles with a seating capacity for 37,000 passengers are to be built. Of these, 481 coaches will be of the vestibuled or corridor types for main line services.

Among the more interesting features of the programme is the provision of an extra streamlined coach for third-class passengers on *"The Silver Jubilee"* train, thus raising the number of vehicles on this popular train to a total of eight. It may be noted that, as recently recorded in the *"Railway Magazine,"* during the overhaul of the "Jubilee" seven-coach set a little while ago a spare eight-coach set of "blue" stock as used on the *"West Riding Limited"* was substituted. The weight of the train was thus 278 tons as compared with the 220 tons of the "Jubilee" set.

Two new train sets, each of 15 vehicles and of an entirely new design, are to be built for *"The Flying Scotsman"* service. A new train also is to be provided for the Hook of Holland boat express between Liverpool Street and Harwich. This train will set an entirely new standard in Continental boat trains.

Another feature of the programme is the special provision that is being made for excursion and party travel. A new tourist car train is being built for service in Scotland; and for the accommodation of pleasure parties 72 specially designed "open" cars will be constructed. New trains also are to be built for cross-country services.

A Mobile Shooting Box

An L.N.E.R. camping coach was put to an unusual use recently when it was hired for the purpose of conveying a shooting party, servants, guns and equipment, and food from Newcastle to a shoot on the Yorkshire Moors. During the week-end's shoot the party lived in the camping coach and at the close travelled back in it to Newcastle. The camping coach, which has cabin accommodation for seven people, a dining room and kitchenette, is particularly suitable for this purpose, but this was the first occasion on which it had been used in this manner.

Locomotive News

New locomotives in service on the L.M.S. include 2–6–2 passenger tank engines Nos. 156-160 and Nos. 185-188. Nos. 5417-5428 of class "5P5F," mixed traffic 4–6–0s have been delivered, and are now in service. No. 5526 of the "Patriot" class has been named *"Morecambe and Heysham."*

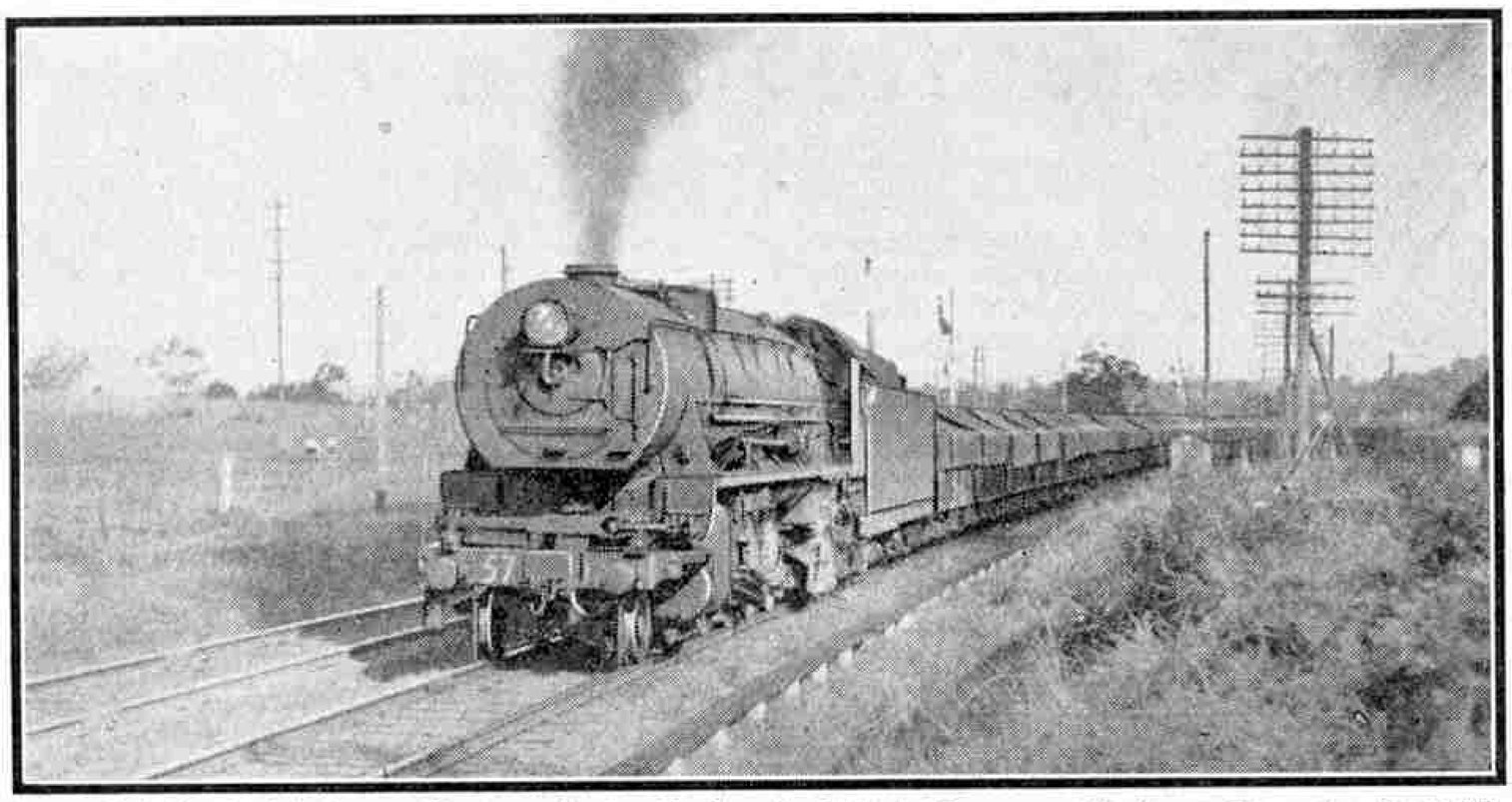
"George the Fifth" class 4–4–0 No. 25348 has been returned to service with a Belpaire fire-box. It has been newly painted and still retains its name *"Coronation,"* this referring of course to the event of the year 1911, when the engine was built.

Two former L.N.W.R. superheated "Precursors," No. 25188 *"Marquis"* and No. 25245 *"Antaeus,"* have recently emerged newly-painted from Crewe Works with their names transposed, so that No. 25188 now bears the name *"Antaeus,"* while No. 25245 carries the name *"Marquis"!* This transposition is evidently an amusing result of the intensive repair methods in vogue at Crewe. It makes the dates given on the nameplates incorrect for these two engines. At the moment of writing No. 25188 is stationed at Chester and works regularly into Liverpool. It makes a brave sight in its gleaming black paint and red lining, and is a reminder of the old "North Western" days. Incidentally, as L.N.W.R. No. 412 *"Marquis,"* this engine ran some trips on the G.N.R. in 1909 in exchange for the experimental running of G.N.R. "Atlantic" No. 1449 between Euston and Crewe. Neither engine was then superheated, but each did well on the other's route.

New L.N.E.R. engines placed in service are No. 4497 *"Golden Plover"* and No. 4498 *"Sir Nigel Gresley."* The latter is the 100th Gresley "Pacific," and it is fitting that it should bear the name of its distinguished designer.

Great interest has been aroused by the return to service of *"No. 10000,"* which has been entirely redesigned. It is streamlined like the A4 "Pacifics" and is painted blue, but it still retains the turbine and dynamo for supplying power for the headlamps and cab lights. Further details will be found on page 21 of this issue. The blue finish also has been applied to No. 2512 *"Silver Fox,"* originally one of the "silver" batch of A4s produced for working *"The Silver Jubilee."* The stainless steel lagging bands and fox emblem that form distinguishing features of this engine are retained.

No. 4780, one of the L.N.E.R. "Green Arrow" 2–6–2s, is named *"The Snapper."* "Snappers" is the colloquial term applied to members of the East Yorkshire Regiment. The nameplates of the engine are rather elaborate. The words *"The Snapper"* appear on a curved plate; below this is a panel in the regimental colours with the regimental crest; below this is a straight plate bearing the words *"The East Yorkshire Regiment"* and *"The Duke of York's Own"* on separate lines. The naming ceremony, which took place at Hull, was performed by Brigadier General J. L. J. Clarke, C.M.G.

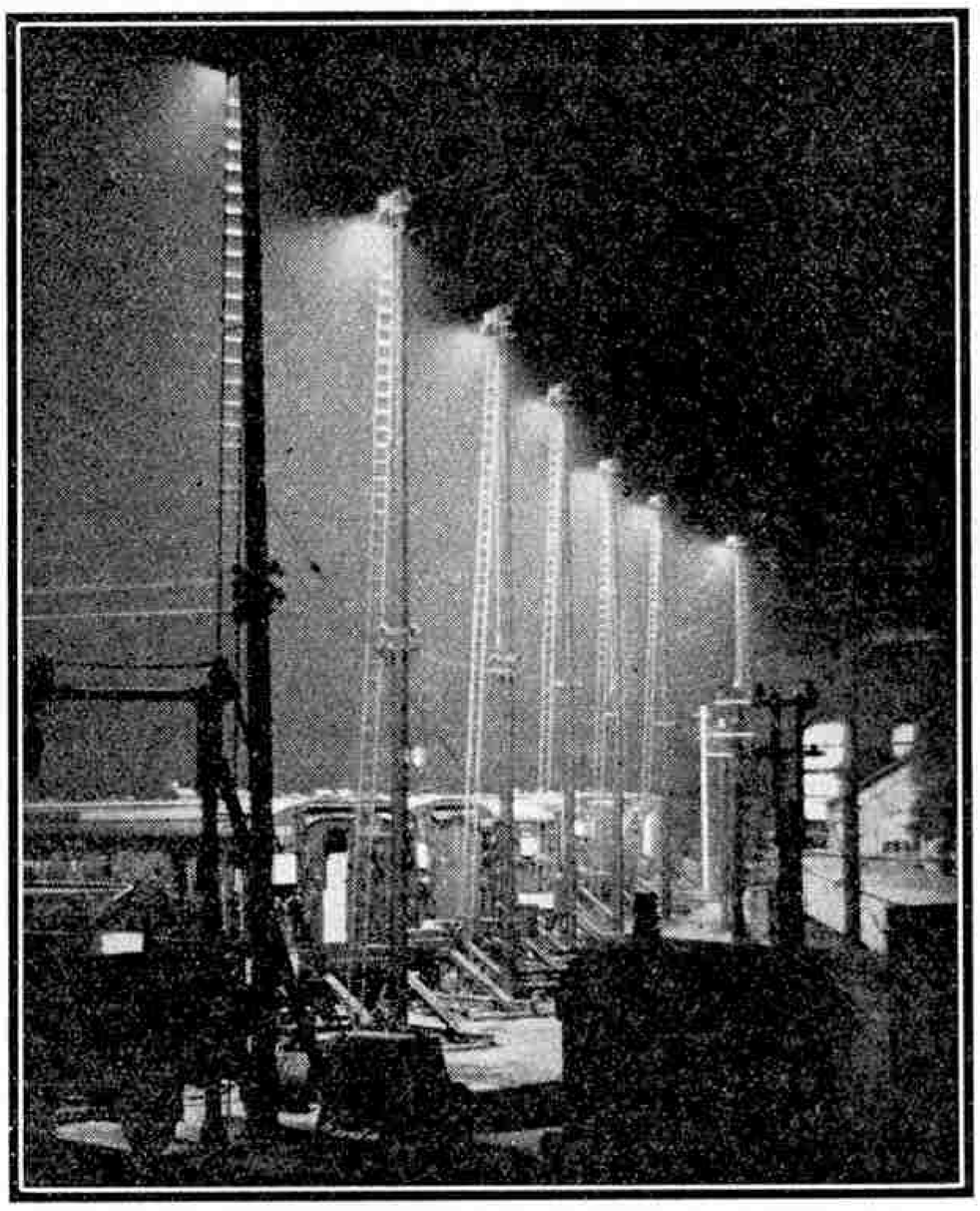


An empty bulk wheat train ascending a gradient on the New South Wales Government Railways. The engine, No. 5705, is one of the 2-8-2 locomotives. Prize-winning photograph by R. M. McMillan (H.R.C. No. 9592), Melbourne.

The G.W.R. locomotive programme for this year includes 10 "Castles," 20 2–8–0s, 10 standard goods engines of the "2251" class, 10 2–6–2Ts and 50 0–6–0Ts.

Painting St. Pancras

An army of painters have started to renovate St. Pancras Station, a job that takes about four months. The work includes the painting of the main span roof, 700 ft. long and 200 ft. wide; cleaning the glass which covers 2½ acres; and painting the station approach and parcels yard. Approximately 3,000 gallons of paint will be used. Deep cream is the keynote of the colour scheme, with the exception of the cases of the main roof girders, which will be brown.



A striking night scene at the S.R. carriage sidings at Wimbledon, showing the effect of the floodlighting. Photograph by R. B. Whitten, Wimbledon.

Britain's First "Atlantic" Locomotive

L.N.E.R. locomotive No. 3990 *"Henry Oakley,"* the first 4–4–2 "Atlantic" type of locomotive to run in this country, has been withdrawn from service. As No. 990 it was the pioneer of the remarkable series of "Atlantics" designed by Mr. H. A. Ivatt for the former G.N.R. The first engines of this series had small boilers and narrow fire-boxes, but from this design was developed the well-known large-boilered version with the wide fire-box so familiar in L.N.E.R. practice.

From *"The Railway Gazette"* we learn that it is probable that No. 3990 will be preserved in the Railway Museum at York. This would be a fitting end to a pioneer locomotive that has covered approximately 1,200,000 miles during its lifetime.

No. 3990 was built at Doncaster in 1898, and its name *"Henry Oakley"* commemorates a famous past General Manager of the former G.N.R. An account of the G.N.R. "Atlantics," including an illustration of No. 990 as first built, appeared in the *"M.M."* for February 1936.

Brighter Canadian Locomotives

Several attempts are being made by Canadian railways to improve the appearance of their passenger express engines, the hitherto dull appearance of which is being relieved by additional colour. The Canadian Pacific Railway have adopted a shade of red that does not differ greatly from the familiar L.M.S. red. The Company's crest appears in a red panel under the cab windows, where the number formerly appeared. On the tender side is a large panel of red, lined in yellow. In the centre of the panel are the words, *"Canadian Pacific."*

The most startling feature, however, is the recent fitting of large smoke deflectors to the "3100" class engines. These plates have been added also to several Canadian National locomotives, including engines of the 4–8–4 "6100" class and the "5300" series of "Pacifics."

We are indebted to Mr. W. B. Moore (H.R.C. No. 20918) of Toronto, for the above information.

British Railways at Glasgow Empire Exhibition

British Railways are to be represented jointly at the Empire Exhibition that is to be held at Glasgow from May to October this year. A Joint Pavilion will be constructed and equipped as a complete Enquiry Bureau, with facilities for first-hand information regarding train services, the issue of railway tickets and the arrangement of reserved seats and sleeping berth accommodation. The rear section of the Pavilion will be semi-circular in shape, and will house a working model railway representative of the practice of the four main line railway companies.

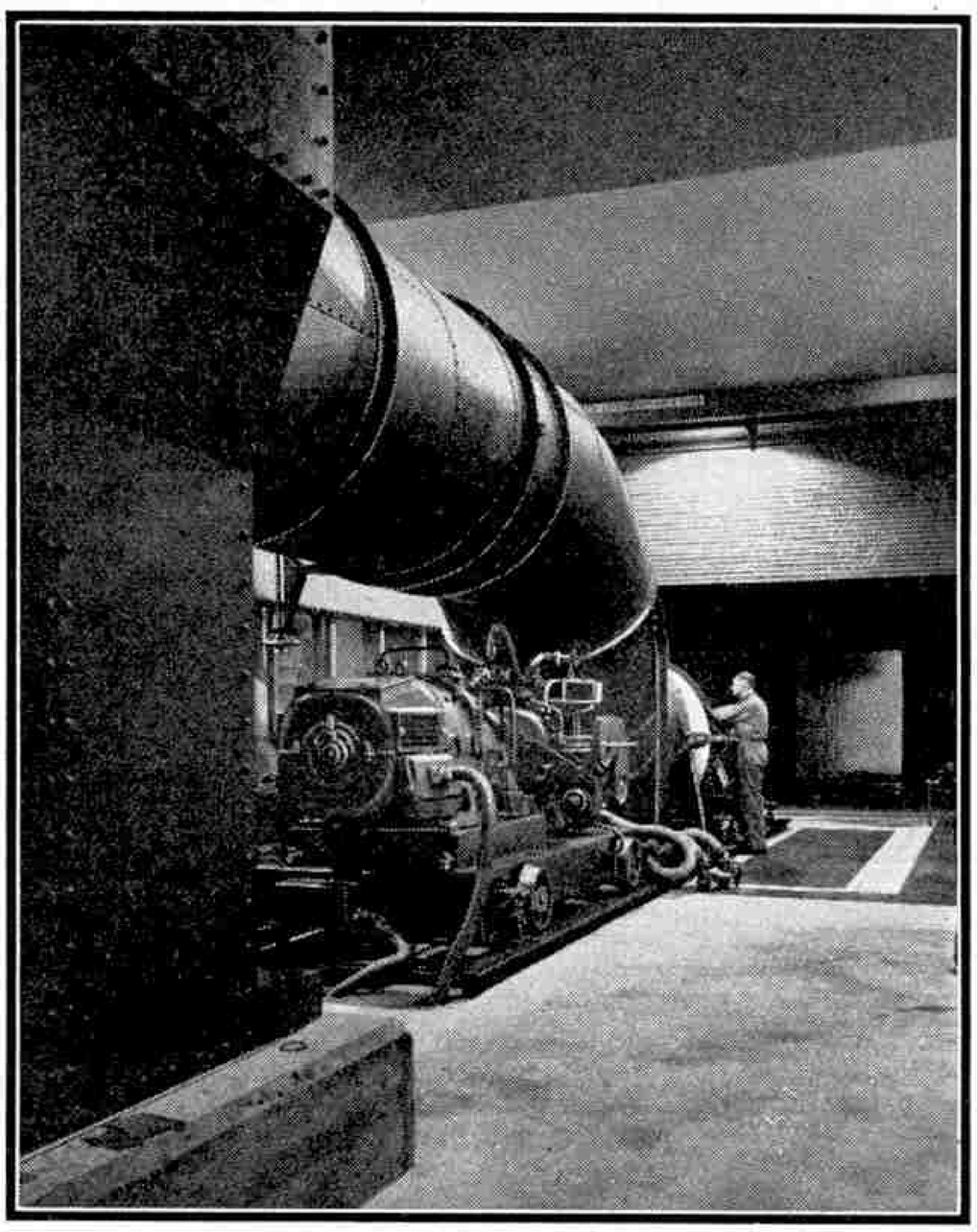
Testing Aero Engines

The Sound-Proofed Test House at the Alvis Works

AERO engines must be reliable in all operating conditions, and must always be capable of developing their full power. Extreme accuracy and high quality of work therefore are essential in making them, and every engine built is subjected to most searching tests. The importance attached to these tests is so great that they are carried out in strict accordance with regulations laid down by the Air Ministry. The work of testing indeed may be said to begin before an engine is made. The raw materials used are first tested to ensure that they conform to Air Ministry requirements, and possess the special properties for which they have been selected, and the parts also are subjected to periodical inspection and tests during the process of manufacture.

The illustration on this page shows the main test house at the new aero engine works of Alvis Ltd., Coventry, and gives a good idea of the elaborate equipment employed. This firm are well-known as the makers of Alvis motor cars, and they have now entered the aviation industry and are manufacturing static radial air-cooled aero engines in this country. The company have built a special works for this purpose, and are now producing the Alvis "Alcides," "Pelides" and "Maeonides" series of engines, giving 1,700, 1,100 and 750 b.h.p. respectively. The testing equipment includes an experimental single-cylinder test shop and a supercharger and accessories test plant, with a main test bed where the completed engines are tried out. Two further engine test beds are installed in premises built by the company on land close to Coventry municipal aerodrome.

The noise created by a powerful aero engine running at high speed is deafening, and special steps have been taken to combat this in the Alvis main test house. This has two walls, separated by a cavity, and each wall is built on separate foundations. Extensive use has been made of sound-absorbing materials. The walls are lined inside with asbestos wool covered by perforated asbestos sheeting, and the floor is effectively insulated from the walls by means of a thick layer of cork.



The main test bed and wind tunnel at the aero engine works of Alvis Ltd., Coventry, to whom we are indebted for this illustration.

Between the roofs of the inner and outer buildings is a long attic-like chamber, one end of which consists of a large fine-mesh wire screen through which the great quantities of cooling air required are drawn when the testing plant is in operation. The inner side of the roof is lined with layers of asbestos blanket kept in position by wire net. The air is drawn into the chamber, and down through a large gauze-covered opening in the roof of the inner building, to a powerful centrifugal fan installed in the huge casing seen on the extreme left of the illustration. The fan is driven by a 550 h.p. motor from a motor generator set situated in an adjoining compartment of the test house, and with this plant air speeds up to 170 m.p.h. can be set up in the wind tunnel. This tunnel extends from the fan casing to the engine test bed.

The used cooling air and exhaust gases pass away through a long, silenced tunnel, which reduces the noise of the engine to the level of ordinary street traffic noises, and is sufficiently subdued to enable conversation to be carried on comfortably at a distance of only a few yards from the engine.

The engine testing equipment, with the exception of the wind tunnel, fan, and its motor, is carried on two four-wheeled units mounted on a special track on the floor. This arrangement enables any size of aero engine to be tested and to be easily accessible for inspection. One unit is situated in front of the tunnel and the other behind it, as shown in the accompanying illustration.

The front unit is simply a strong frame that supports the aero engine, and in shape rather resembles a cone on its side with the wide base facing the wind tunnel. The engine for test is lifted by a two-ton overhead crane and lowered to the test bed, where it is bolted into the wide end of the frame, so as to fit into the mouth of the wind tunnel. The torque reaction set up when the engine is rotating, is taken by a flexible support at the rear of the frame and by two strong springs, one at each side. During test operations the unit is raised off the track by means of four jacks operated simultaneously by a hand-wheel at the front.

The rear unit carries the 150 h.p. D.C. motor used for starting and running in the engine, the motor driving through a clutch and two-speed gear box. This unit also carries the Heenan and Froude hydraulic dynamometer for measuring the torque reaction and horsepower of the engine. The dynamometer is specially fitted for control from an adjoining room, in which its readings are taken. This control room has sound-proofed walls, and the long windows on the side facing the test bed are double and of wired glass. More than 30 controls and measuring instruments are mounted on the main panel in it. They include many thermometers, pressure gauges and switches, a petrol flow-meter and two graduated glass bulbs, with which the petrol consumption is checked by timing.

The first aero engine of a new type is subjected to severe special tests, in accordance with Air Ministry regulations. These include an endurance test of 50 hrs. in five non-stop periods, the engine being run at full throttle for nine of the final 10 hrs., and a high-speed test at 5 per cent. above the highest number of revolutions per minute permissible when in flight. In addition there are slow running and acceleration tests, and petrol and oil consumptions are carefully checked.

When the new type has been passed for production, every engine built to that design must satisfy what are called "acceptance" tests. These consist of a preliminary "running-in" period in which the speed of the engine is gradually increased, and slow running and full speed settings are carefully verified; and a two-hour test during which the engine is run at 90 per cent. of its rated power, except for the last five minutes when it is run at full throttle.

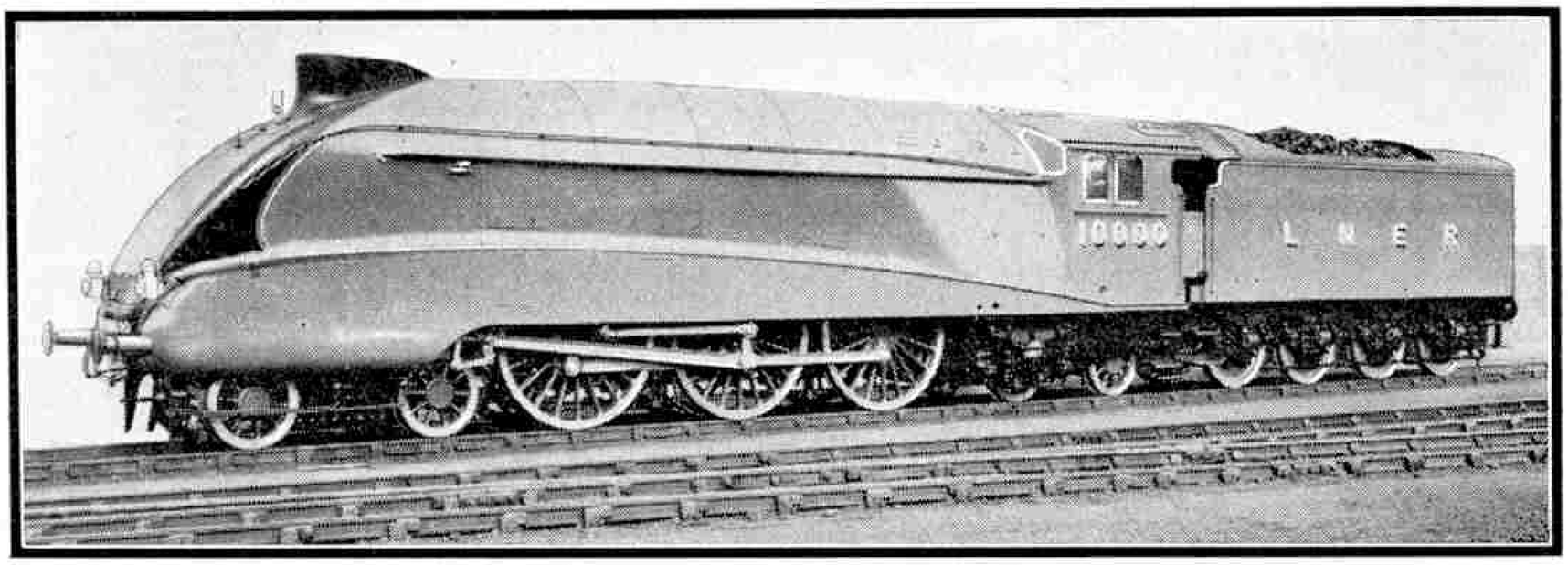
Up to the present three types of Alvis aero engines have been introduced. These are the 1,700 h.p. "Alcides" and "Alcides Major," the 1,100 h.p. "Pelides" and "Pelides Major," and the "Maeonides Major," which is of 650–750 h.p. All are air-cooled, radial engines with their cylinders arranged in double banks. They are very efficiently cooled, and have a power-weight ratio that is only a fraction above 1 lb. per h.p. Their low overall diameter and the clean external design simplify their installation in modern aircraft, and also make for more efficient cowling than previously was possible.

In the names of these engines the word "Major" is used to distinguish fully supercharged engines from the moderately supercharged ones of the same type. The rated altitudes of the "Alcides Major" and the "Pelides Major" are 13,000 ft. and 12,000 ft. respectively and that of the "Maeonides Major" is 13,000 ft. The two "Alcides" have 18 cylinders, and the "Pelides" and the "Maeonides Major" have 14. All have maximum power outputs well above that at which they are rated.

L.N.E.R. "No. 10000" Rebuilt

An Interesting Experiment in Engine Lighting

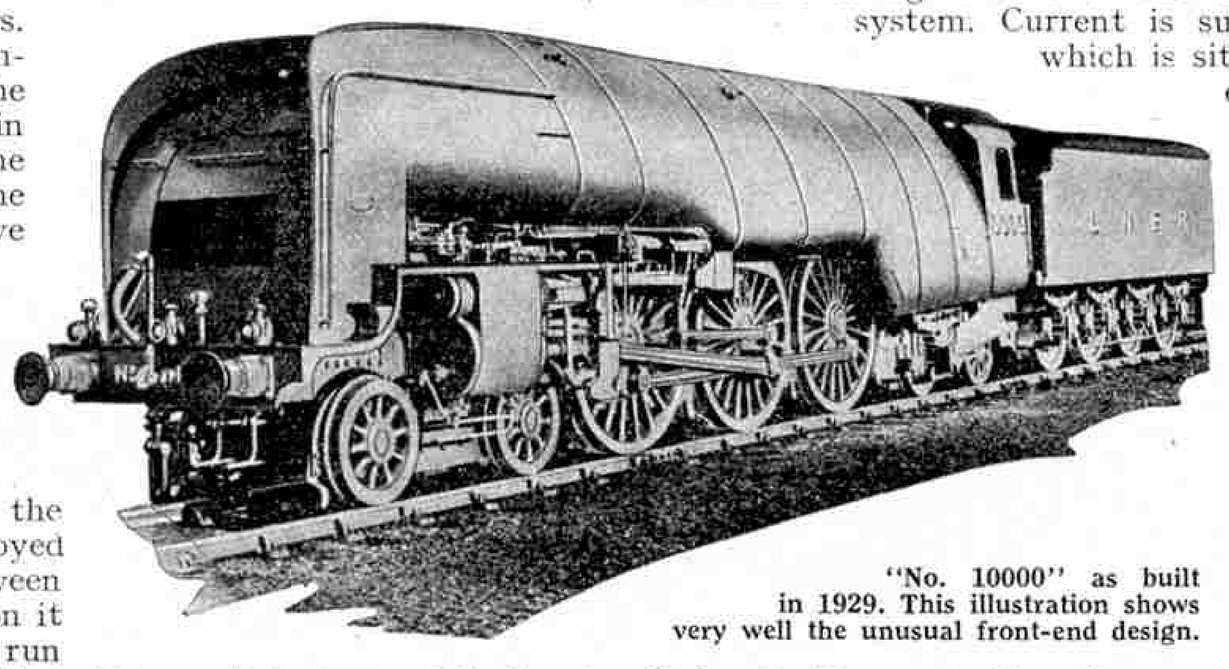
LATE in 1929 railway circles were startled by the introduction of a new L.N.E.R. locomotive giant, the external appearance of which was unlike anything that had been seen previously on British metals. This was the 4–6–4 engine *"No. 10000,"* which in several respects was a most unusual locomotive. The reason for its design was to discover whether more efficient and economical working would be possible by using steam at a much higher pressure than is customary in locomotive work, and by employing the compound principle in order to take the fullest advantage of its expansive properties.



L.N.E.R. "No. 10000" rebuilt as described on this page. It is now similar in external appearance to standard "A4" Pacifics, and is finished in the blue livery adopted for the latest engines of this type. Photograph reproduced by courtesy of the L.N.E.R.

The working pressure adopted was 450 lb. per sq. in., and to provide for this a water-tube boiler was incorporated in the design. In order to support the trailing end of this boiler the 4–6–4 wheel arrangement was adopted for the first time in this country for an express passenger locomotive. Four cylinders were employed, two high-pressure outside the frames and two low-pressure between them.

Externally the engine presented a remarkable appearance for the boiler casing was arranged to present a smooth unbroken surface; and it was not immediately apparent, except from a head-on view, that the locomotive had any chimney! This was due to the fact that the chimney projected through the top of the sloping smoke-box, but it was hidden by smoke-deflector plates formed as a forward projection on each side of the boiler casing. The object of this curious front-end design was to ensure that the exhaust steam and smoke from the chimney were thrown up clear of the cab windows. In this the arrangement was entirely successful and, although the engine seemed very strange in 1929, it plainly indicated "the shape of things to come." The front end of the 2–8–2 locomotive *"Cock O' The North"* was arranged in a similar manner and the characteristic horizontal wedge formation of the present L.N.E.R. streamlined locomotives has been developed from it.



"No. 10000" as built in 1929. This illustration shows very well the unusual front-end design.

"No. 10000" was located in the North Eastern Area and was employed principally on express trains between York and Edinburgh. On occasion it worked on the longest non-stop run in the world, that of *"The Flying Scotsman"* between King's Cross and Edinburgh. It proved to be a powerful, fast and free-running engine, but in spite of the use of high-pressure steam and compound working the engine did not prove economical in coal consumption. As it was using considerably more fuel than the standard L.N.E.R. "Pacifics," it was decided to substitute a boiler of the ordinary locomotive type as used on the 2–8–2 "Cock O' The North" class engines, but with a working pressure of 250 lb. per sq. in. At the same time the four-cylinder compound principle was abandoned, and three-cylinder single propulsion, standard on the L.N.E.R., was adopted. As thus rebuilt and finished externally in a similar manner to the latest "A4" class "Pacifics," the engine was put to work again on express services to and from King's Cross late last year.

"No. 10000" now weighs 107 tons 17 cwt. or nearly 5 tons more than one of the standard "A4" Pacifics. Its three cylinders are each 20 in. in diameter by 26 in. stroke, the diameter being 1½ in. greater than in an "A4." Each cylinder is cast separately, and the exhaust from the outside cylinders is carried to the blast pipe base through passages in the cast steel saddle. The tractive effort at 85 per cent. of the working pressure is 41,437 lb., which makes the engine Britain's most powerful six-coupled express locomotive.

A "Kylchap" double blast pipe and chimney is fitted, and it will be noticed from the upper illustration on this page that the chimney casing is somewhat larger than the standard pattern fitted to the streamlined "Pacifics." The connecting and coupling rods are of nickel chrome steel. The valve gear follows standard practice, in which the outside valves are operated by means of Walschaerts gear, and the inside valve is worked from this by the usual Gresley arrangement of conjugating levers. The maximum cut-off is 65 per cent.

The coupled axle-boxes are lubricated mechanically and this system is used also for supplying oil to the valves and cylinders, one feed being placed in each steam pipe and one on the top of each cylinder barrel. The two lubricators are driven from one return crank on the right-hand trailing crank pin. Four oil boxes, each with nine syphon feeds, lubricate the valve spindles, piston rods, and other parts.

An interesting feature of the engine is the electric lighting system. Current is supplied by a turbo-generator, which is situated at the front end of the engine. This illuminates the headlamps and also the lamps fitted in the cab. Lamps are placed under the skirting and between the frames in order to facilitate engine examination, a new development that gives a remarkable appearance to the engine when in motion. The switch box for all the lights is located under the driver's seat.

The cab is particularly commodious as a result of the carrying of the rear end of the engine on four wheels. Owing to its greater length as compared with that of an "A4" Pacific, the front of the tender has been provided with an extended coal delivery chute, so that the fireman does not have to carry his fuel over an excessive distance. Flexible rubber roofing is fitted over the gap between the cab and the tender front. The tender is of the standard corridor type, running on eight steel disc wheels. It is equipped with the Pullman type vestibule and Buckeye coupler that is standard on L.N.E.R. main line coaching stock. The tender accommodates 5,000 gallons of water, and is fitted with water pick-up apparatus. The coal space holds 8 tons of fuel.

Since its rebuilding *"No. 10000"* has been responsible for some striking performances. On one run recorded in *"The Railway Gazette"* the engine gained 13½ min. in all from Darlington to King's Cross on the up *"Flying Scotsman"* with a load of 470 tons.

The Conquest of the Dead Sea

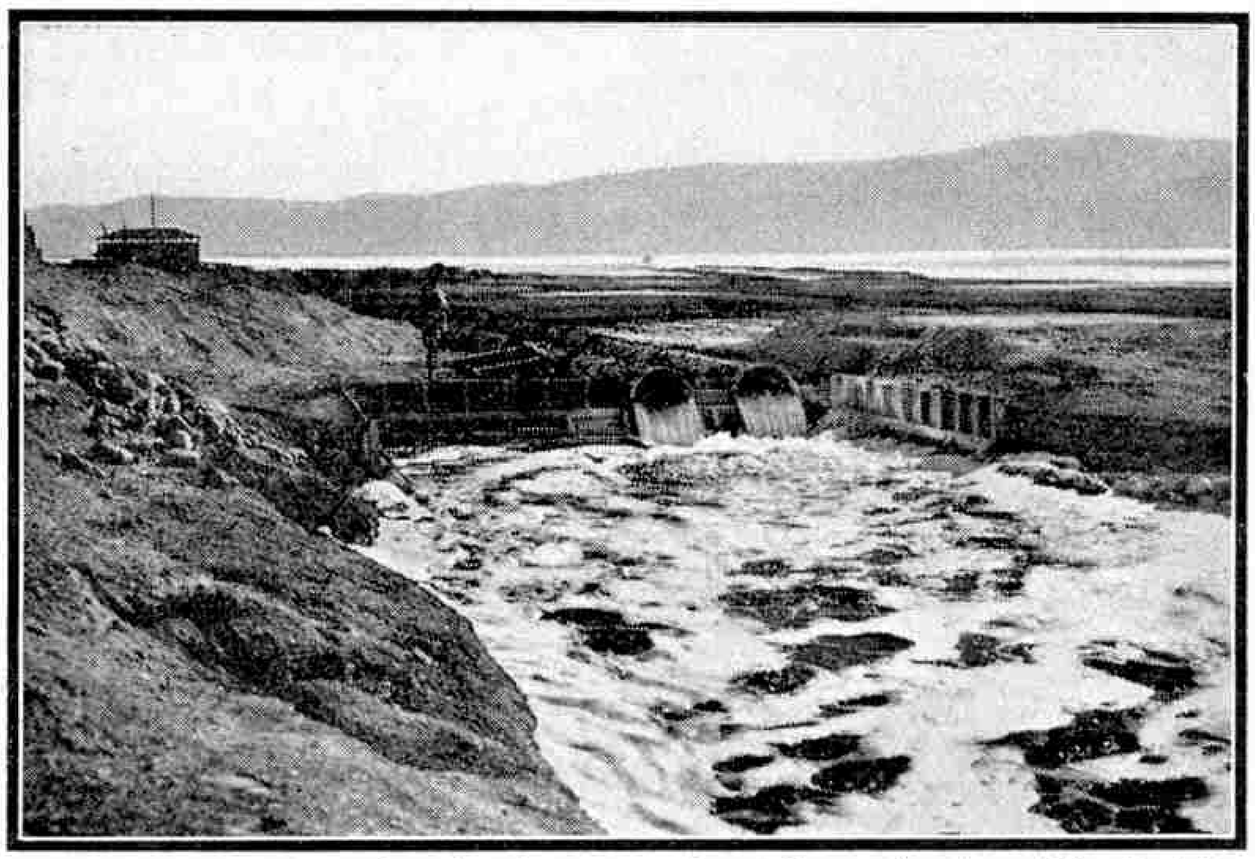
Tapping a Great Store of Chemical Wealth

By Harold J. Shepstone, F.R.G.S.

NO part of Palestine has witnessed such a transformation as that remarkable sheet of water, the Dead Sea. A decade ago this hot, barren, mountainous and isolated region, although of interest geographically and for its historic and Biblical associations, was looked upon as of little value commercially. Its waters were known to contain valuable salts, but no one believed it possible to recover them on a commercial scale. Yet to-day that has been accomplished, and the achievement forms one of the romances of modern industry. Formerly only a few nomadic Arabs were to be found dwelling upon its shores. Now there are two large flourishing commercial settlements, one at the northern end of the lake established a few years ago, and a second, more recently-completed, at the southern end in addition to a modern Lido. These settlements have in them nearly 1,000 Jews and Arabs, with their wives and families, and are model camps in the wilderness.

This conquest of the Dead Sea can be traced largely to the foresight, patience, energy and determination of a clever Jewish chemist and engineer, Mr. M. A. Novomeysky, who spent nine years upon its shores carrying out experiments, making detailed observation of the region, and taking soundings. Like many others he knew that the waters of this remarkable inland sea contained potash, needed so urgently as a fertiliser, and bromine and magnesium chloride, which form the basis of so many drugs, but it was not known whether they could be recovered on a commercial scale. So with an assistant he spent years upon the shores of the lake, making prolonged and systematic investigations. It was necessary to know the exact salt contents of its waters, and to what extent its specific gravity varied at different depths. It was still more important to learn whether the salts could be recovered by solar evaporation, and for this it was necessary to build experimental tanks, pump the water into them, and note results. This proved trying work, carried out in an excessively hot region far from any centre of supplies.

Carnallite or crude potash obtained from the water of the Dead Sea by evaporation in the Sun. Arab labourers are heaping it up in readiness for conveyance to the factory in which it is refined.



Water flowing through wooden pipes from a pumping station on the shore of the Dead Sea. It passes through a canal about three miles long on its way to the evaporation pans.

The Dead Sea forms part of a depression, or rift in the Earth's surface. The rift extends much farther than the boundaries of Palestine, for it runs down to the Gulf of Akaba, and crossing to the African continent reaches the great lakes in Central Africa. It is deepest in the neighbourhood of the Dead Sea, the surface of which is 1,290 ft. below the level of the Mediterranean. It is indeed the lowest sheet of water on the face of the globe, set in a weird, yet awe-inspiring region, with its mountains of rock salt, its picturesque gorges, quaint little oases, and hot springs.

The sea has a length of over 47 miles, an average breadth of 9 miles, and a maximum depth of 1,300 ft. It is estimated that from the River Jordan and other smaller streams an average of over 350 million cu. ft. of water pour into it daily. As there is no outlet, this is all dispersed by solar evaporation, evidence of the great heat of the region.

The waters of this strange inland sea are so salt and bitter that no fish can live in them and it is impossible for a human being to sink. Whereas in oceans, such as the Atlantic, the proportion of mineral salts is only 3½ per cent., in the Dead Sea it reaches 25 per cent., and a fresh egg placed in the water will float away as easily as if it were a cork.

When the potash company started operations at the northern end of the Sea they required the whole of the area there for their works. As many tourists from Jerusalem visited this district, a small area at the north-eastern corner of the Sea was set apart as a tourist centre, known as Kallia. It has developed into a go-ahead resort with restaurants, cafes, bathing and boating facilities, and a large hotel is now in course of erection there. A fleet of motor coaches carry visitors to and from Jerusalem some 25 miles away by road.

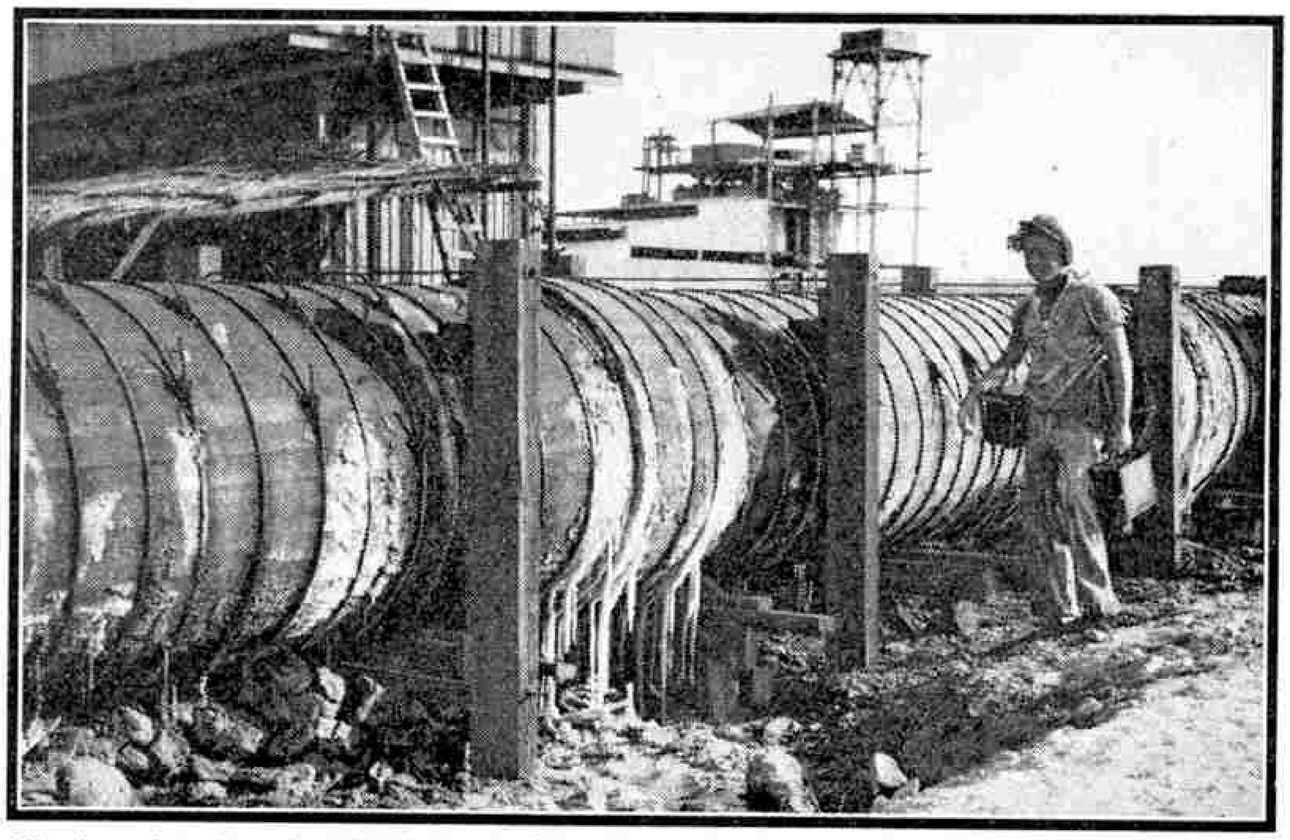
A popular time to visit Kallia is at full moon, and on such occasions the writer has counted as many as 200 persons in the water at one time. No diving is permitted, and bathers are warned not to get the water into their eyes. The workers at the potash plants are not allowed to stay in the water more than a quarter of an hour at a time unless there are facilities for a douche in fresh water afterwards.

When Mr. Novomeysky's experiments showed that potash and other valuable salts could be successfully recovered from the waters of the Dead Sea, a plant was laid down upon its northern shores. First a motor road was built to link the site with the Jerusalem-Jericho road. Workmen were collected, and barracks built to house them, and the desolate region became a place of great activity. A power-house, pumping-station, refinery and workshop were also erected.

The evaporating pans stretch for two miles along the shore, and run back on either side of the River Jordan. They are from 7½ to 30 acres in extent, and cover a total area of 1,000 acres. The brine is pumped into these pans by a great suction pipe laid on the bottom of the Sea at a depth of 175 ft., for soundings showed that at this depth

the water contains twice as much potash and bromine as on the surface.

The pipe is 2,500 ft. long and 30 in. in diameter. It was welded together in sections on the bank, but the most difficult task was to lay it in position on the sea bed. Owing to unfavourable weather conditions and other causes it took six days to launch. A diver had to be sent down to bolt the sections of the pipe together, and as the Syrian who had been employed for this purpose found it impossible to work in the brine-saturated waters an experienced diver had to be brought out from England. At the newly-established works at the southern end of the Sea the water is being pumped from the surface. There it was not found necessary to lay a pipe to a particular depth, as the proportion of salts in the water is the same at all levels.

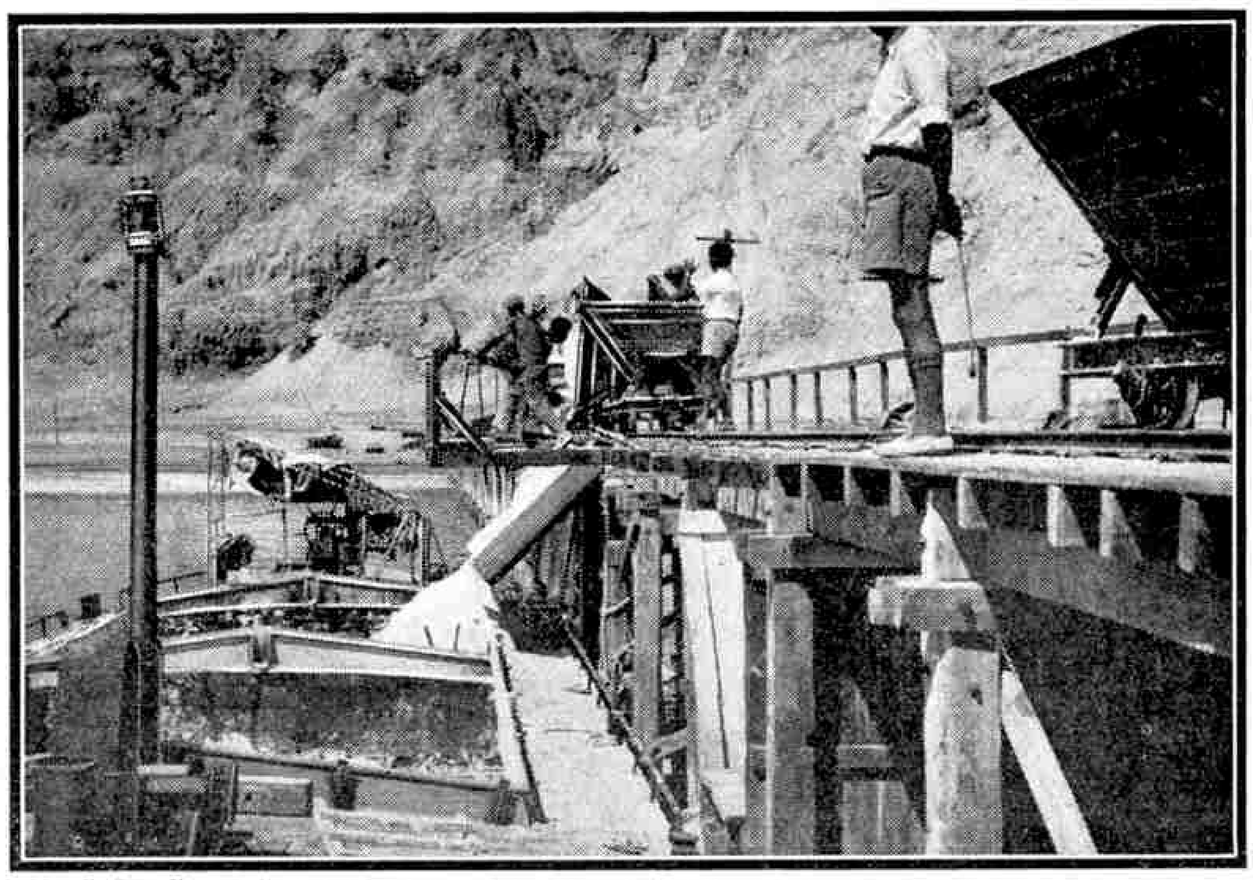


Wooden tubes through which the water flows at the Dead Sea potash works. Leakages are immediately marked by the formation of stalactites of salts owing to evaporation.

At both the northern and southern plants the brine is pumped into the farthest and highest of the evaporating pans, which are so arranged as to allow a constant slow movement of the brine from one pan to another, in a zigzag, downward flow towards the Dead Sea. The pans have sluice gates permitting regulation of the flow, or the temporary shutting off when necessary of any of the pans. In the course of such a slow flow, the brine becomes more and more concentrated. Common salt is first to be deposited, and with further concentration, carnallite, or crude potash, separates out.

The carnallite is collected as soon as a depth of three to four inches has been deposited. It is conveyed to the mixers in the refinery, where it is decomposed with cold water, and on further treatment potassium chloride of any required degree of purity is produced. The brine left after separation of the carnallite contains bromide in a concentrated form. This is pumped to the bromine factory, where liquid of a very high degree of purity is extracted. Magnesium chloride and calcium chloride are also obtained.

The potash is a white powder somewhat resembling fine table salt, and 90 per cent. of that produced to-day is used as a fertiliser. It can be used in the natural state, or mixed with phosphates or nitrates. It also finds a place in the manufacture of explosives. Bromine is a dark reddish brown, highly corrosive liquid, which is volatile and gives off heavy vapours. Bromine compounds such as sodium, potassium and ammonium bromides, are used in almost every civilised country. Bromine finds its principal outlet in the manufacture of ethylene dibromide, however, used in making tetraethyl lead. This is the anti-knock compound that assures the smooth running of motor car engines when it is added to petrol.



Loading potash into a barge from the pier at the southern end of the Dead Sea.

The present output of the northern plant is 30,000 tons of potash and 1,200 tons of bromine a year. Since in this district the area of flat land suitable for building pans is limited, the company have also acquired about 23 sq. m. of ground at the southern end of the Sea, and during the past two years their engineers have been busy building a power-house, pumping stations, refinery and warehouses, laying out the necessary evaporating pans and establishing a camp for the workers. This settlement has been given the name of Sodom. It is situated at the base of Jebel Usdum, a mountain of rock-salt seven miles long and 500 ft. high, standing at the extreme south-western corner of the lake. Some scholars believe that Sodom and Gomorrah of the Bible story stood somewhere in this region. It is interesting also to note that though this sheet of water is referred to many times in the Bible, it is never alluded to as the "Dead Sea," but as the Salt Sea.

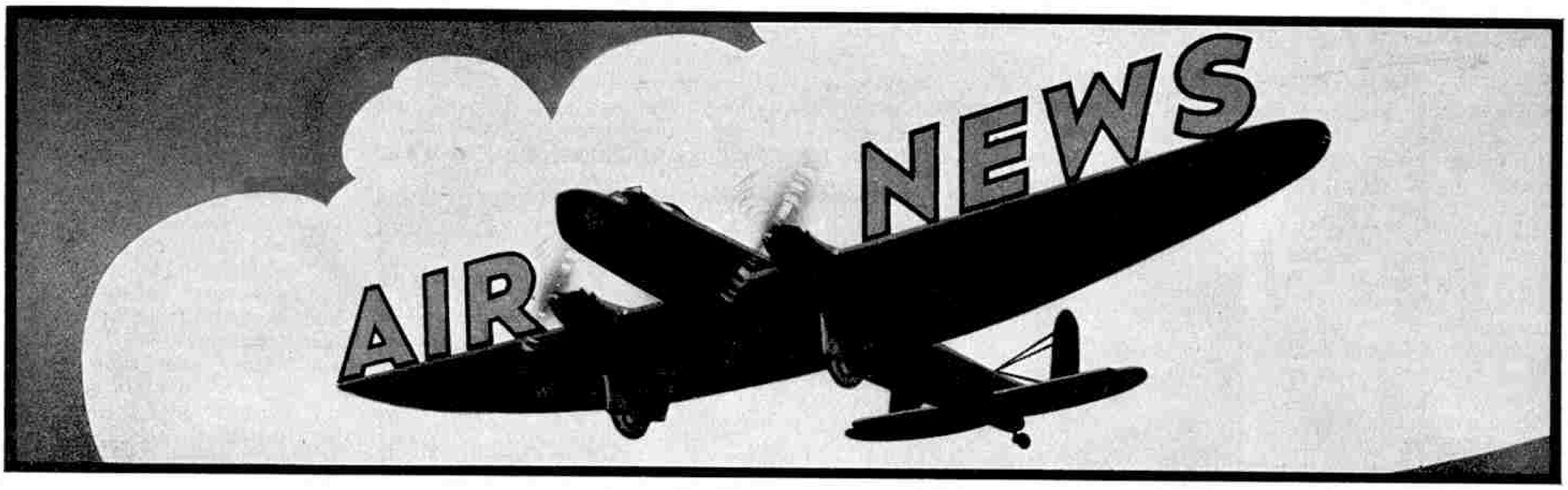
The laying down of a modern commercial plant in this hot and isolated region was a difficult task. A whole year was spent in surveying the district. All the lumber, machinery and stores for the plant had to be conveyed by water from the northern end of the Sea, for the district itself furnished nothing. To land these materials, a pier was erected near Jebel Usdum. At the end of two seasons' toil, the evaporating pans had been built, brine was being pumped into them, and potash was being sent in specially-built barges to the northern end of the Sea for shipment to Europe.

Working conditions at the southern settlement during the summer months are very difficult, and every fourth week the staff and workmen are sent away for a week's respite from the great heat. Few realise how hot the region is in summer. Readings taken at the northern end over a period of several years show maximum temperatures of 132 deg. Fahr. in the shade, and 167 deg. Fahr. in the Sun. The temperature in the water is often higher than that of the surrounding air. In the south the heat is even greater than at the northern end of the Sea.

Yet the region can hardly be described as unhealthy. Lying 1,290 ft. below sea-level, the air contains six per cent. more oxygen than at ordinary sea level. There is an entire absence of fog, the atmosphere is dry and the air clear. There are no mosquitoes or troublesome sand-flies. The salts obtained from the waters form the basis of many drugs used to combat and cure disease, and breathing the air that contains them in suspension is very beneficial. The waters are also highly radio-active, and compare favourably in this respect with the waters of those European spas esteemed for their curative properties. These are the reasons given by scientists for the healthy condition of the toilers at the Dead Sea. Malaria and other diseases attributed to heat are unknown among them.

When the southern plant is in full working order the company declare they will be able to export 100,000 tons of potash a year, and other salts in proportion. Government experts who have made independent investigations estimate that there are at present more than 1,000 million tons of potash and over 800 million tons of bromine, in addition to many other salts, in this single sheet of water, and at the present rate of consumption these quantities are sufficient to supply the world's need of these chemicals for the next 2,000 years. But these valuable salts are continually being added to the lake, for they are brought down by the Jordan in solution from the hot springs of Tiberias and also enter from hot springs in the immediate neighbourhood. The Jordan alone pours into the Dead Sea about 40,000 tons of potassium chloride yearly. The main volume of water is received during the rainy winter and the early spring seasons, when evaporation is lowest, while in summer and early autumn, when evaporation reaches its maximum, the inflow is comparatively small.

With the exception of Diesel oil for generating electric power, all the commodities used in the production of the potash and other valuable salts—the waters of the Dead Sea, the Sun, and fresh water from the rivers—are available on the spot.



A Flying Test Bed

The aeroplane illustrated on this page is the Northrop low wing monoplane with which flight tests of the new Bristol "Hercules" 14-cylinder engine are being carried out, as described in last month's *"Air News."* It is an all-metal stressed-skin aeroplane of sufficiently robust construction to withstand the strain of the high output obtained from the "Hercules" engine, and forms an ideal flying test bed. There are two cockpits, one behind the other and both fitted with dual control, and the canopy over them has sliding sections, the aft portion being hinged.

The dimensions of the Northrop monoplane are: span 68 ft., length 28 ft. 10 in., and height 9 ft. 1 in. No figures of the performance of the aeroplane or the engine are yet available.

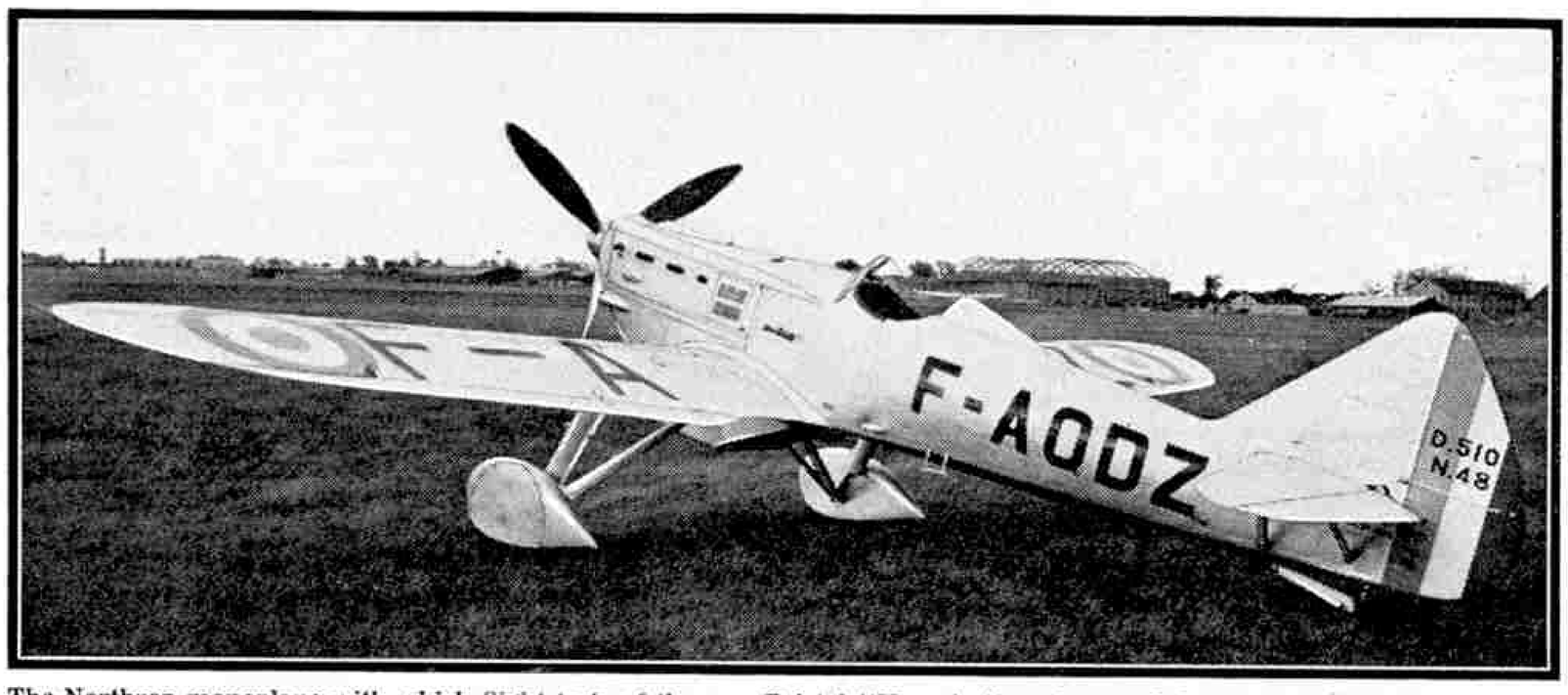
To Africa by Flying Boat

Mrs. Martin Johnson, the widow of the famous explorer, was a recent passenger in an Empire flying boat from Southampton to Kisumu, where she transferred to a specially chartered aeroplane that conveyed her to Nairobi. Mrs. Johnson had been engaged in an advisory capacity by a film company, in connection with the African scenes for a film *"Stanley and Livingstone,"* and in Africa she was at the head of a film unit that included 20 white men, three coloured cooks and several thousand natives. She has related that on one occasion 2,000 natives in full war kit staged a wild charge in which they rushed up until they were brandishing their spears within a few inches of the camera-men.

After her work in connection with these scenes Mrs. Johnson returned to England, again travelling by the Imperial Airways service from Kisumu. On arrival she commented upon the speed with which it is now possible to travel by air from African jungles to the heart of civilisation.

* * * *

Great interest has been aroused by the invention in Germany of a helicopter that can fly backward, as well as rise straight into the air.



The Northrop monoplane with which flight tests of the new Bristol "Hercules" engine are being carried out. Photograph by courtesy of the Bristol Aeroplane Co. Ltd., Filton.

The England-Australia Flying Boat Route

A further stage has been reached in the organisation of the India–Australia section of the Empire flying boat route. The Imperial Airways "Kent" class flying boat *"Satyrus"* recently carried out an inspection flight from Alexandria to Singapore, during which comprehensive tests were made of new equipment at marine airports along the route. This has been followed by a survey flight over the Karachi-Singapore section of the route by the big Empire flying boat *"Cordelia."* This was the first visit of an Empire flying boat to Singapore, where a fine airport has been provided for the use of these aircraft.

The survey flights by *"Satyrus"* and *"Cordelia"* are a necessary preliminary to the establishing of regular flying boat services between Southampton and Singapore, and eventually through to Australia.

Award to Commander of *"Caledonia"*

The Guild of Air Pilots and Air Navigators have awarded the Johnston Trophy for 1937 to Capt. A. S. Wilcockson, the Commander of the *"Caledonia."* This was one of the two Empire flying boats that took part last summer in the series of experimental flights across the North Atlantic between Foynes, Ireland, and Botwood, Newfoundland, and it gained the distinction of making the fastest crossings in both directions.

The Johnston Trophy is a memorial to Squadron Leader E. L. Johnston, the navigator of the airship R101, who perished when the airship crashed in France in 1930. It is awarded annually by the Guild for what they consider to have been the best British air navigating feat of the year.

New London Terminus for Imperial Airways

Work is now in hand on the new London terminus for Imperial Airways, and when completed next summer it will be the most modern building of its type in the world. It is being erected on an extensive site on the east side of Buckingham Palace Road, Victoria, and has a frontage from Elizabeth Bridge of nearly 500 ft. The rear adjoins No. 17 platform of Victoria Station. The air terminus will have a special railway platform to enable traffic to be handled with a minimum of delay, and the plans include provision for electric train connections to and from both the Empire air base on the south coast and the airport for Continental traffic.

The new building will be surmounted by a tower, rising to a height of 170 ft. above street level, in which there will be a clock with dials 14 ft. in diameter. The tower will be floodlit at night. The ground floor will be devoted chiefly to traffic requirements, and will contain one of the largest booking halls in this country. The upper floors will house the headquarters staff, and on the top floor of the tower there will be much of the intricate electrical equipment necessary in a structure of this kind. The familiar sight of porters carrying luggage will not be a feature of this modern air terminus, however, as all luggage and goods will be conveyed from motor vehicles through subways to the electric trains.

Airship Mooring Mast to be Dismantled

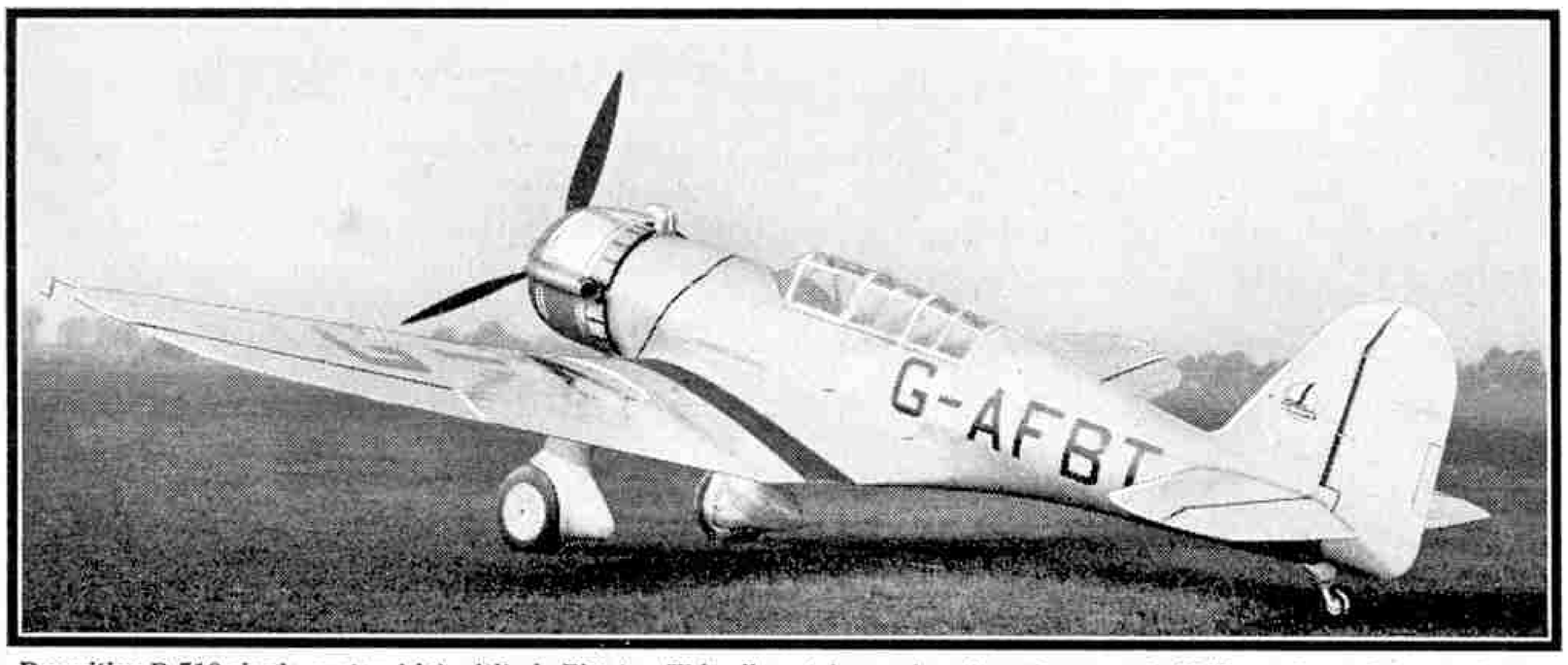
It is reported from Canada that the Dominion Government have decided to dismantle the airship mooring mast at St. Hubert Airport, Montreal. This mast was erected at a cost of about £200,000, and was only used once, when the R.100 visited St. Hubert in August 1930 on the occasion of her successful flight across the Atlantic. The airport was intended to be a calling point in an Empire-wide airship scheme, but the ambitious project was abandoned after the disaster to the R.101. For a long time air transport companies serving that part of Canada have declared the lofty mast to be a menace to air navigation. It is expected that the mast will be sold as scrap metal.

Air Services to Winter Sports

In Finland winter services are being organised to transport passengers for weekends to northern winter sports resorts. The aircraft employed will be fitted with skis and will alight on the frozen surfaces of lakes. It is probable that later fully equipped aerodromes will be established in the northern areas of the country, and regular facilities for the sports traffic will then be available.

Each winter an increasing number of winter sports enthusiasts travel by air to Switzerland and Austria. Many fly by Imperial Airways from London to Paris, and spend a few days at the French capital before continuing by air to the particular winter resorts they have chosen. Others go by the services of Swissair, travelling in that company's aircraft from Croydon direct to Zürich, where trains, connecting with the air arrivals take the passengers on to the various winter sports centres.

The air services of the S.A.B.E.N.A. Company enable enthusiasts who prefer the Austrian winter sports zones to get there as quickly as possible. These services transport passengers by air to Vienna, where they can transfer to internal air services operated by an Austrian company, or to trains, for conveyance to the winter sports regions.



Dewoitine D.510 single-seater, high altitude Fighter. This all-metal aeroplane has a top speed of 250 m.p.h., and is armed with two machine guns in the wings and a cannon that fires through the airscrew boss. Photograph by courtesy of Société Aéronautique Française, Paris.

A Collector of Old Aircraft

The collecting hobby now embraces an extraordinary variety of subjects. Many years ago Mr. R. D. J. Nash, the well-known English automobile engineer, began collecting early types of aircraft, and he has recently enriched his collection with three early Blériot aeroplanes, one of which was built in 1909 and the other two in 1910. Until recently these aeroplanes were in the possession of M. Leon Molon, a French garage proprietor who, at 65 years of age, is one of the oldest French pilots. His pilot licence was obtained in September 1910, and bears the number 25.

New Speed Record for Landplanes

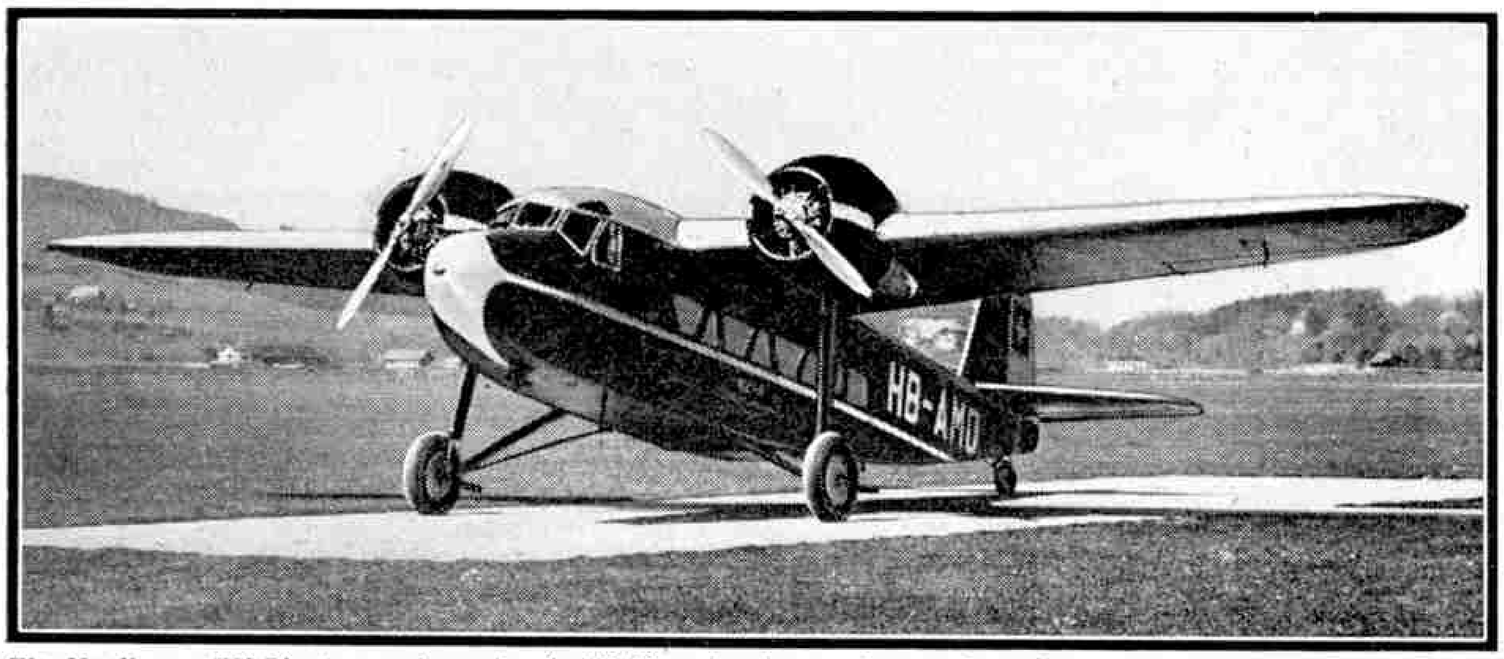
A new world speed record for landplanes, of 379 m.p.h., has been achieved by Dr. Wurster, chief pilot of Bayerische Flugzeugwerke A.G. The successful attempt was made at Augsburg, with a Messerschmitt Bf 109 single-seater fighter, in the presence of a Commission of the Fédération Aéronautique Internationale. The new record speed is 27 m.p.h. faster than the previous one, which was set up by Howard Hughes, the well-known American racing air pilot.

Airport for Cork

Cork is to have a well-equipped airport, which will be constructed on a specially selected site at Midleton, about 13 miles from the city. It will cost about £33,000, and the Irish Free State Government will pay half of this sum. When the airport is completed Cork will probably be linked up with the Dublin–London air service operated by the Irish Company Aer Lingus Teoranta and by Olley Air Service.

500th Flight on D.L.H. Route

In 1928 the Royal Dutch Air Lines began a fortnightly air service between Amsterdam and Batavia, in the Dutch East Indies. The service has been maintained with characteristic regularity, and the steady growth of the traffic has led to the service being increased from time to time, and to-day there are three services each week. The 500th return flight between Amsterdam and Batavia was made recently, and since the inception of the service a total of more than 10,000,000 miles has been flown on this important air route.



The Koolhoven FK 50, shown above, is a fast 8/10-seater transport monoplane. It was described in detail in the July 1937 "M.M." Photograph by courtesy of N.V. Koolhoven Vlietuigen, Rotterdam.

The Sunday Dinner by Air

On Sundays residents of an hotel in a remote, far north region of Australia now enjoy a dinner that comes to them by air. The proprietor has arranged with a catering firm established more than 1,000 miles away, to put various items of the menu aboard an aeroplane leaving every Saturday. This aeroplane reaches an aerodrome near the hotel on Sunday, just in time for the food to be cooked for dinner.

Handley-Page Bombers to be Built at Belfast

The large new aircraft factory erected at Belfast for Short Bros. and Harland and Wolff will shortly begin production of an improved version of the Handley-Page "Hampden" bomber. This is a twin-engine middle wing monoplane, and the new version will be fitted with two Napier "Dagger" engines instead of the Bristol "Pegasus XX" engines of the original machine. The Napier "Dagger" is a 24-cylinder in-line engine of the "H" type, and is claimed to be one of the most powerful in the world. It is anticipated that with this new equipment the performance of the "Hampden" will be very remarkable, and trials are awaited with interest.

Present Strength of the R.A.F.

In reply to a recent question in the House of Commons, the Under Secretary of State for Air stated that the present strength of the R.A.F. is 123 squadrons. He explained that this figure includes 70 bomber squadrons, 15 of which are stationed overseas, and 30 fighter squadrons, all of which are in this country.

Another Proposed Transatlantic Air Service

Plans are in hand for a transatlantic air service operated by Air France in co-operation with Pan-American Airways. Arrangements have been completed for the two companies to work together on the necessary preliminary research, and meteorological observations will be exchanged. For the present Air France will use the air bases at Marignane, near Marseilles, and at Biscarosse, but it is probable that eventually a seaplane and aeroplane base designed specially for transatlantic traffic will be established a few miles from Paris.

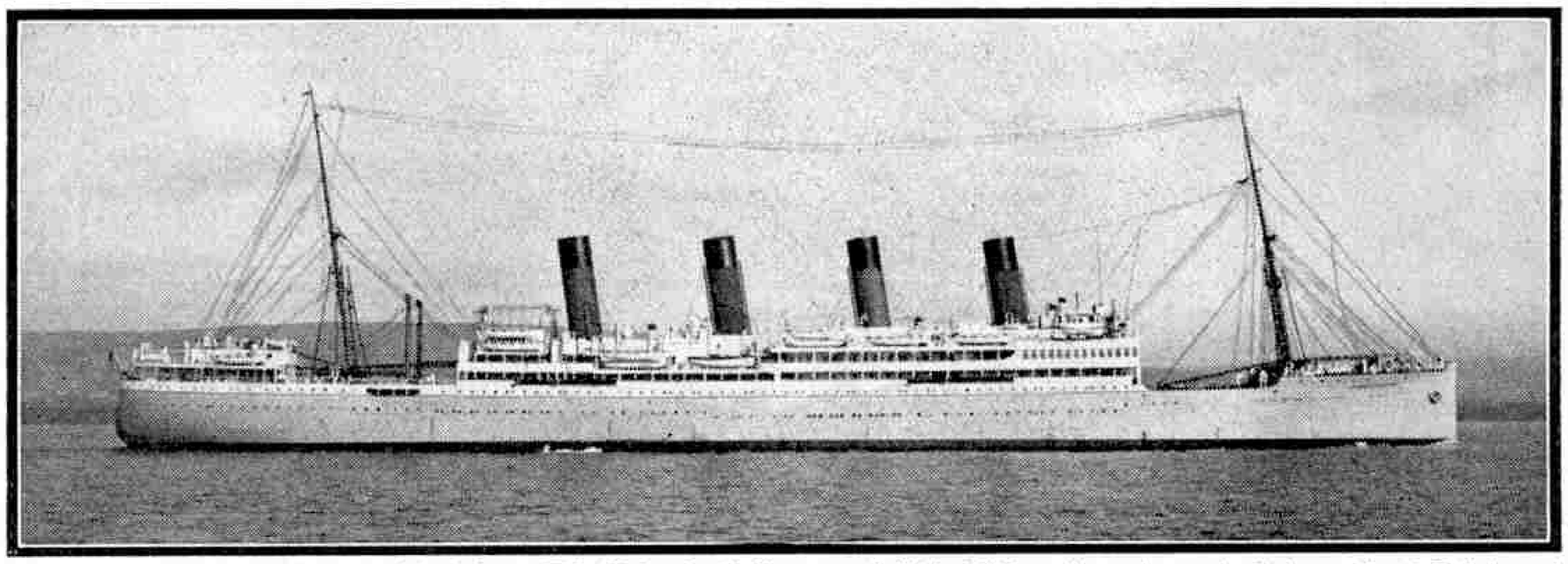
Record Freight Traffic of Canadian Airways

Canadian Airways Ltd., the chief air transport company in Canada, report that a record amount of traffic was dealt with on their air routes during 1937. During the first nine months of the year their aircraft flew daily a total of about 5,900 miles and carried an average of 50 passengers, 10½ tons of express luggage and freight, and 1¾ tons of mails a day. The company also carried out a good deal of survey work, under contract, and large areas in British Columbia, Labrador, Quebec, and Newfoundland were surveyed and photographed from the air by means of specially-equipped machines.

Speeding Up the "*Arundel Castle*"

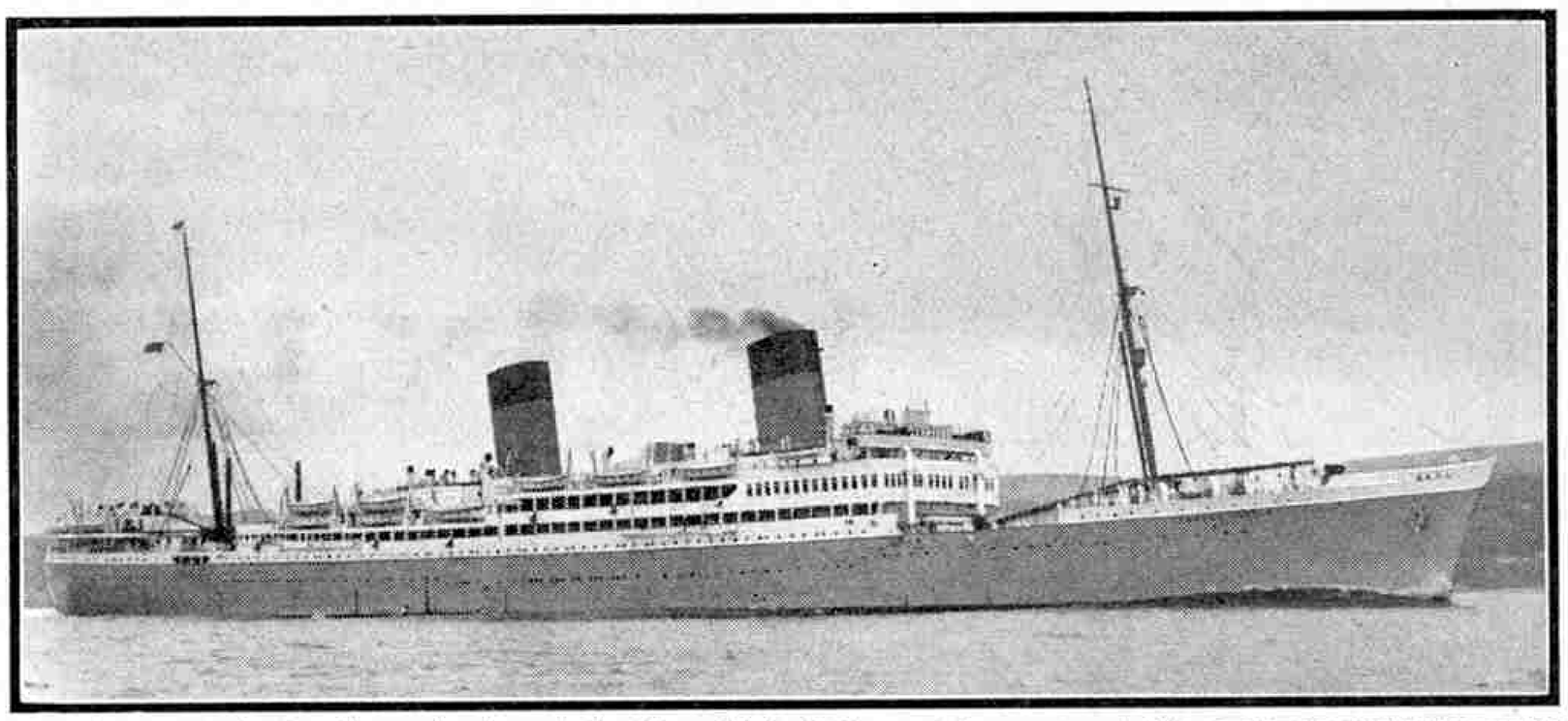
Five Union-Castle Liners Modernised

THE Union-Castle liner *"Arundel Castle"* has been re-engined and modernised at Belfast by Harland and Wolff Ltd., and recently ran extensive trials before leaving Belfast to rejoin the South African mail service from Southampton. When she emerged from the yards in which this work was done, her appearance was strikingly modern and in complete contrast to that in which she has been a familiar figure in the South African service since she entered it in 1921. This is seen in the two illustrations on this page, which show the liner before and after her modernisation.



R.M.S. "Arundel Castle" in her original form. This Union-Castle liner was built in 1921, and was in service between Great Britain and South African ports. Her present appearance is shown in the lower illustration.

Similar conversion work is to be carried out on the *"Windsor Castle,"* now at Belfast, the *"Caernarvon Castle,"* the *"Warwick Castle"* and the *"Winchester Castle."* This programme of modernisation is being carried out to enable the five Union-Castle ships concerned to maintain the high speeds required under the company's 14-day mail service to the Cape. The accelerated service was inaugurated on 21st August, 1936, when the Union-Castle motorship *"Stirling Castle"* left Southampton for Capetown. This fine vessel, which was described and illustrated in the May 1936 *"M.M.,"* completed the passage in the record time of 13½ days, reducing by over 24 hours the former record established 43 years previously. Since her record run the *"Stirling Castle,"* together with her sister ship, the *"Athlone Castle,"* has been operating regularly on this route.



After nine months in the ship repairer's yard, the "Arundel Castle" emerged a new vessel. The conversion work was carried out by her original builders, Harland and Wolff Ltd., Belfast, to whom we are indebted for our illustrations.

Our upper illustration shows the *"Arundel Castle"* as a characteristic liner of 1921, when four funnels were considered necessary, and streamlining was not thought of. In her new form seen below the vessel has a greater suggestion of speed and power than formerly. This improvement in appearance has been achieved largely by two changes. The first of these has been the replacement of the four tall funnels by two, which are somewhat shorter, and are well-proportioned and of modern streamline design. The second is the lengthening of the bow by about 15 ft. on the waterline. This has allowed her formerly straight stem to be gracefully raked in the manner of the *"Athlone Castle"* and *"Stirling Castle."*

The overall length of the vessel is now about 686 ft., her moulded breadth 72 ft., and her gross tonnage approximately 19,100. She does not merely appear more powerful, for she has been fitted with new and up-to-date machinery in order to increase her speed. This consists of triple-expansion geared turbines, supplied with steam by four Babcock-Johnson water-tube boilers. Although this installation is more powerful than the original machinery, it occupies less space. Deep oil fuel tanks have been built in what was formerly the No. 2 boiler room, and also at the sides of the new boiler rooms in place of the original coal bunkers, and the total fuel capacity is 6,300 tons.

The increased speed capabilities of the vessel have necessitated the fitting of a new rudder of streamline semi-balanced type, together with electrically-driven steering gear. In addition two new propellers of the latest type have been fitted.

Modifications and improvements also have been made to the passenger accommodation in order to bring it into line with modern requirements.

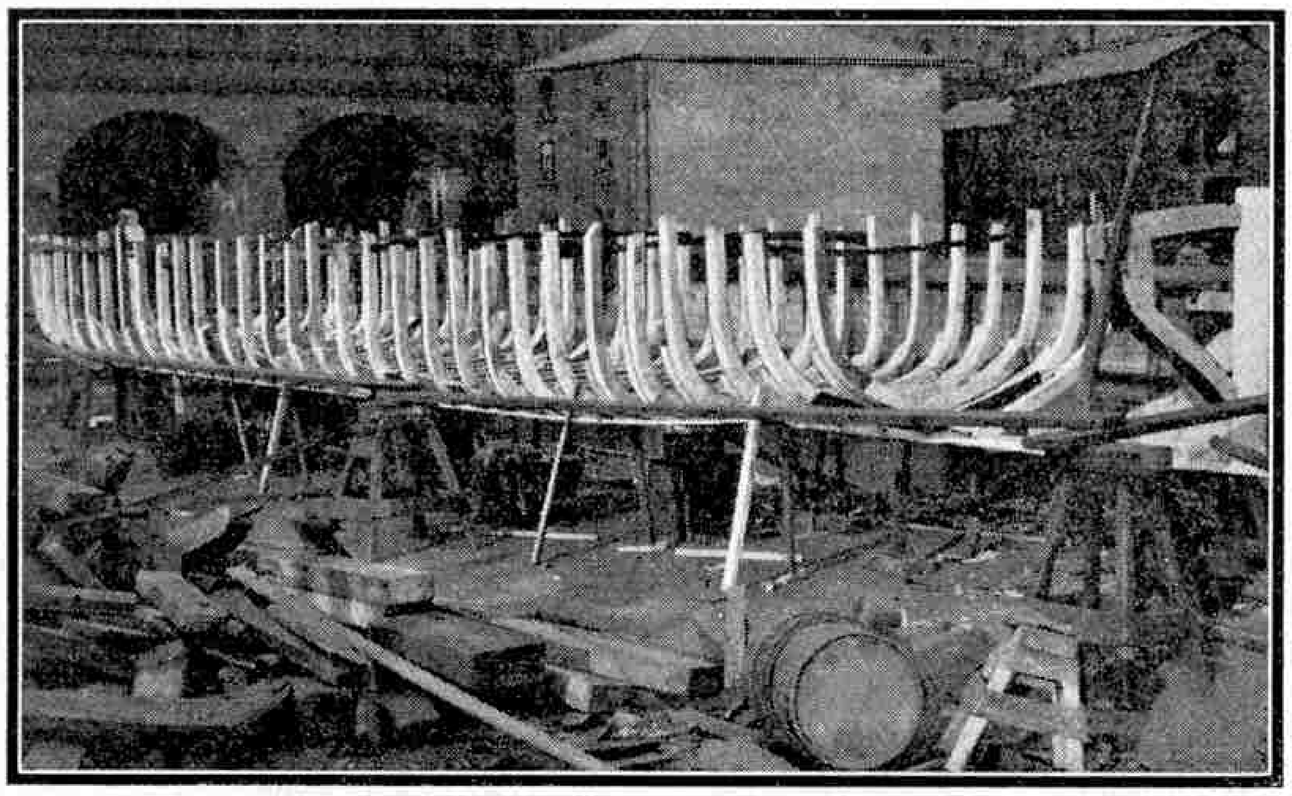
Canal Barges in the Making

Shipwright's Work in Inland Yards

By G. Bernard Wood

THERE are 4,673 miles of canals and canalised rivers in Great Britain. Although most people will have at some time peered within the flat-bottomed boats that ply along these waterways, carrying grain, coal, cement and other commodities, few have seen one being made. Their construction is full of interest. Some navigation companies make their own barges, and others are made at private boat-building yards.

The sight of a barge-to-be in one of its first stages is really startling. The scores of ribs, or "timbers," fixed to the keel give it a strong resemblance to the skeleton of some prehistoric monster. When covered with side timbers, its frame reminds one of a Viking Ship. This connection is not imaginary, however, for the modern barge is a direct descendant of the stately, dragon-prowed craft that brought Scandinavian invaders to our shores and up our rivers more than 1,000 years ago.



The first stage in the building of a barge, when the ribs, or timbers, have been fixed to the keel.

English oak and elm are used exclusively in barge-building. Curved trunks of oak are favoured because their shape roughly corresponds to that of the barge-ribs. "Curved trunks," says a prominent boat-builder, "haven't to be sawn out of the straight; therefore ribs made from such timber benefit from the natural twist in being so much the stronger. Only the planks that are rounded at the bows have to be bent, and this is done by steaming them."

Carpenters engaged in adze work on a barge on the stocks.

All the timber has to be well seasoned, and tree trunks bought for barge-making will probably rest in the boat-builder's yard for three years. Eventually an intricate system of mechanically-operated rollers carries the huge logs inside the sawmill. There a horizontal saw is used to split the logs into planks ready for the carpenters and shipwrights, who cut and trim them as required for different parts of the boat.

When the rib-like structure already mentioned has been assembled, a steel keelson or inner keel is bolted to the inside of the framework. This is later raised on the "stocks," where the shipwrights clothe it with massive planks, bolting each in position and finishing off the outer surface with adzes.

In the meantime there is much activity beneath the hull, where several men are engaged in "caulking" the seams. Oakum is used for this purpose. Four separate coils of this loose hemp, a valuable material formerly prepared for shipwrights' use by convicts, are driven into each seam by means of a "caulking" iron and mallet, and then fixed securely with a "making" iron. Later, each seam is covered with pitch.

The furnishing of a barge is simple. After providing ample accommodation for a cargo of 70 to 100 tons, there is little room for domestic refinements. The boatman's living quarters are equipped with cupboards, shelves, table, and sleeping bunk, however. Like every other part of the craft, they have to undergo a Board of Trade inspection, and it is the Board's inspector who, after pronouncing a boat to be well and truly built, gives it a registration number.

One rarely sees a barge of to-day decorated as in the past. Formerly fancy designs were carved on them, and their rudder posts were decorated with Turk's heads and ornamental ropework. This points to the fact that the first "boaties," as the men who form their crews are called, were sailors who had been used to richly carved figureheads, gaudily painted boards, and other adornments on their sea-going craft.

Nowadays a shipwright glories in draught and tonnage. If a barge measuring say 62 ft. 10 in. from stem to stern, and having a beam of 14 ft. 9 in., will carry 70 tons at 4 ft. 3 in. draught, its builders may rightly claim to have produced a boat that for craftsmanship, though not for grandeur, will bear comparison with the State barges of three centuries ago. This pride is given full expression in the ceremony with which a barge is launched.

Unusual Models of 1937

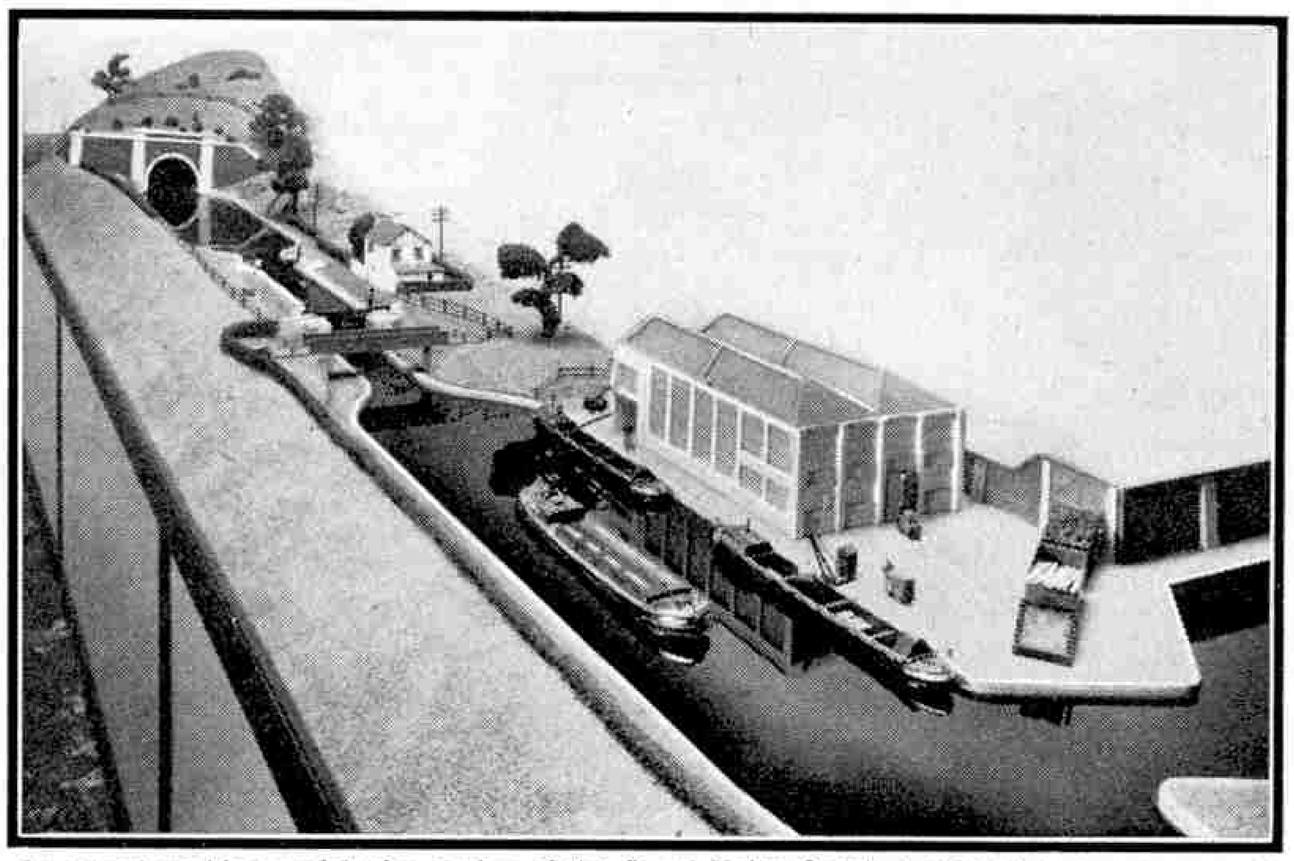
A Wonderful Working Miniature Canal

By W. J. Bassett-Lowke, M.I.Loco.E.

EVERY year sees the production of outstanding models of railways, engines, ships and other subjects which arouse great interest, but it is the unusual in models that captivates the experienced enthusiast in this fascinating hobby.

Last year great exhibitions such as the British Empire Exhibition at Johannesburg, and the wonderful International Exhibition at Paris, gave the model-makers of the world a chance to show their ingenuity. For instance, there was a "Royal Scot" Dining Car sent by the L.M.S. to South Africa for the Johannesburg Exhibition. This model was complete, with absolutely everything in detail as on the real coach, including vacuum pipes, tables set with knives, forks, spoons and serviettes, and the kitchen compartment with all its cooking utensils. The coach was cut away to show half the roof, leaving the other part exposed with all the interior detail visible. The underframing was accurately wrought in metal, and all the structure work carefully shown. The coach itself was in hard wood, painted, lined, lettered and varnished, and, to add the finishing touch, it had interior illumination.

At the Paris Exhibition there were many British models, and not the least interesting was a panorama review of the British merchant fleet, made in an original setting. The onlooker viewed the miniature ships passing across a seascape just as they would be seen from the portholes of an oceangoing liner. The Duke of Kent was particularly impressed by this.

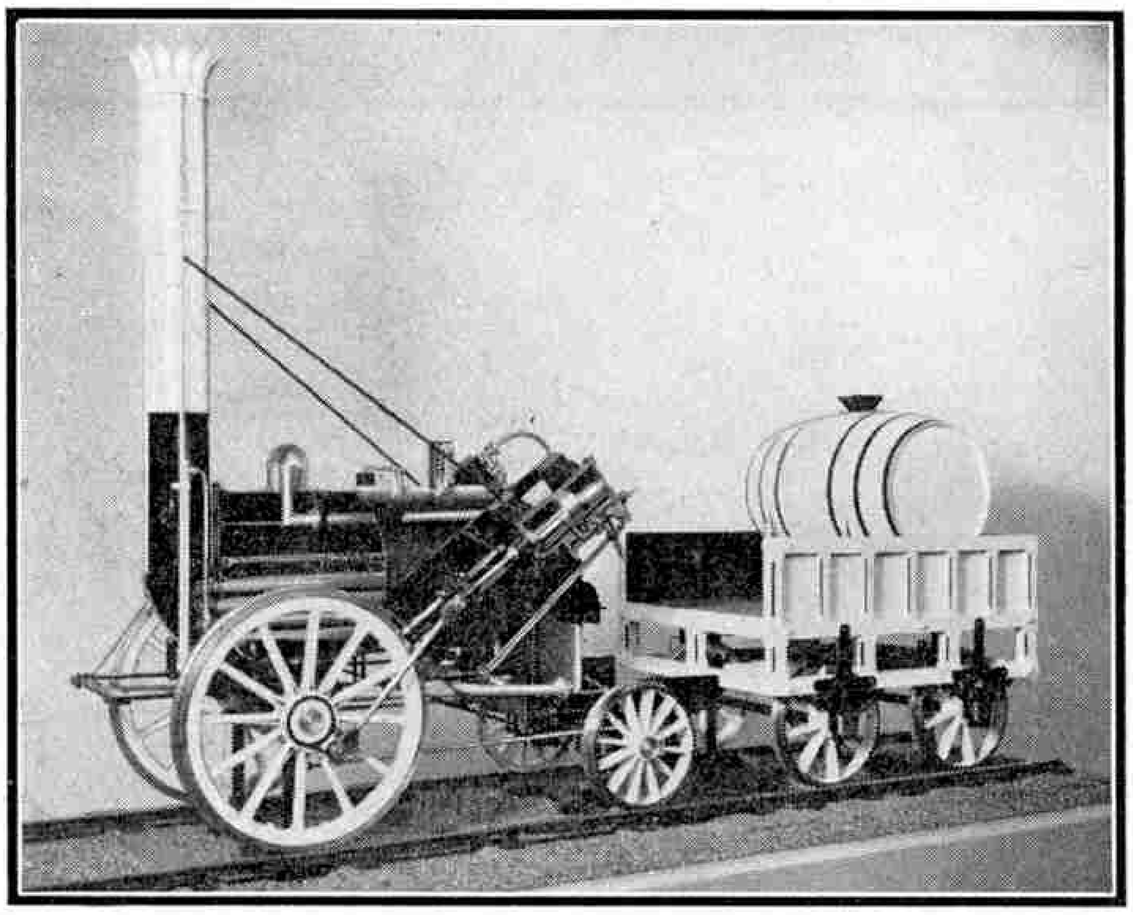


An actual working model of a section of the Grand Union Canal. A model Diesel-engined barge passes up and down the canal, and is automatically worked through the lock.

The lower illustration on the opposite page is of a set of workshop machine models, which show an amazing amount of skilful detail. The Drummond capstan lathe, No. 5, was the most difficult of these machines to model because of the peculiar shapes of the bed and headstock castings. This model and the planing machine, No. 2, were capstan driven from underneath by a small Klaxon motor, which through a system of shafts and gears under the base gives various rotary speeds, as well as a reciprocating or longitudinal motion for the planer. All the machines are built up to represent heavy castings. Various modern materials were utilised in making them, and each was finished as grey metal.

One of the most delicate operations was the modelling of the all-geared head on the capstan lathe. It has specially modelled external control and the small wheel, shafts and turret head, and saddle traverse have fine neat work in them. Even all the small nuts are shown. It took six skilled men six months to build this set of models, and they were shown working on the stand of Imperial Chemical Industries Ltd. at the Engineering and Marine Exhibition at Olympia this autumn.

The lower illustration on this page shows a model of Stephenson's famous "*Rocket*" in section. The National Scottish Museum at Edinburgh, not wishing to be behind the Science Museum at South Kensington, have now added to their other model exhibits this detailed $1\frac{1}{2}$ in. scale model.



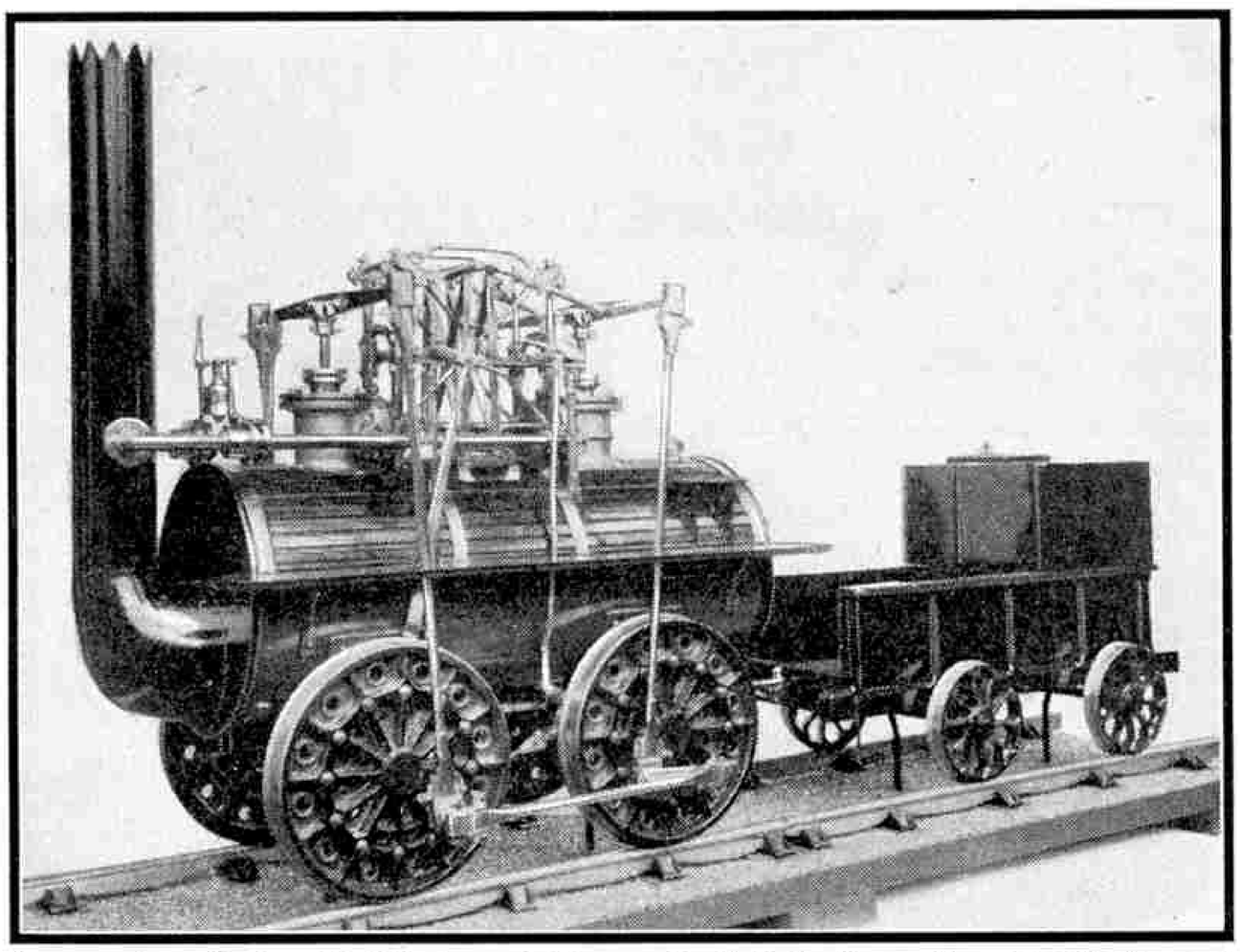
A sectional model of Stephenson's "Rocket," showing the tubular boiler, the steam pipe in the dome and the internal arrangements of one of the cylinders.

Models of early locomotives in museums and in private collections are rarely working models in the fullest sense of the term, although they are usually capable of operation by electric motors. Special interest therefore is attached to another Stephenson model, built to the same scale, for this is an actual working model. It represents "*Locomotion*," the first locomotive of the Stockton and Darlington Railway, built in 1825.

The model has a copper boiler lagged with mahogany, and has the complete and intricate overhead motion of the

original, connecting the two vertical cylinders on top of the boiler to the four driving wheels. This elaborate "grasshopper" gear is specially constructed for working conditions, and its components are made of nickel-plated steel. The curiously-designed driving wheels are reproduced in cast iron. The engine is complete with a feed pump worked off the motion, and is fitted with a reproduction of the crude pattern of chimney of iron plates built up, in the original, as an upward extension of the single flue passing through the boiler.

A four-wheeled tender is attached to the engine, and reproduces the actual vehicle as fitted with a rectangular sheet-iron water tank at the rear. The engine and tender together are 3 ft. 11 in. in length, and the engine is 23 in. in height to the top of the 16 in. chimney. They stand on a length of track composed of fish-bellied rails laid in old-type chairs on imitation stone sleepers that reproduce the original permanent way of the Stockton and Darlington Railway.



An accurate working model of Stephenson's "Locomotion," the first locomotive of the Stockton and Darlington Railway. The model stands on a representation of its original track.

The model was constructed to the order of Robert Stephenson and Co. Ltd., of Darlington, the firm founded in 1823 by George Stephenson in his son's name, and the actual makers of the original engine. It was not reproduced from the original engine, now kept on a stone pedestal in Darlington station, but from the old model belonging to the firm. The first works of its owners were situated at Forth Street, Newcastle-on-Tyne, and there they built "*Locomotion*," the first engine of the British railway.

In my opinion the most interesting model of all is the miniature canal shown in the upper illustration on the previous page. This contains nine gallons of water, and includes a motor barge and model lock. Certainly it is a model fit for a millionaire to play with. Glimpsing it at eye level, with the minute shadows of such familiar country objects as trees, telegraph poles and bridges reflected in the dark water, we might almost think that we had stepped into Gulliver's Lilliput.

At a recent British Industries Fair thousands of people stopped to admire the accuracy of detail and the splendid working of the model, but one thing puzzled them. How does the barge keep such a straight course up the canal, through the lock, turning neatly at the basins at each end without a hitch? Those who thought the barge was attached to the bottom were baffled when the attendant smilingly lifted out the barge to replenish the electric batteries inside.

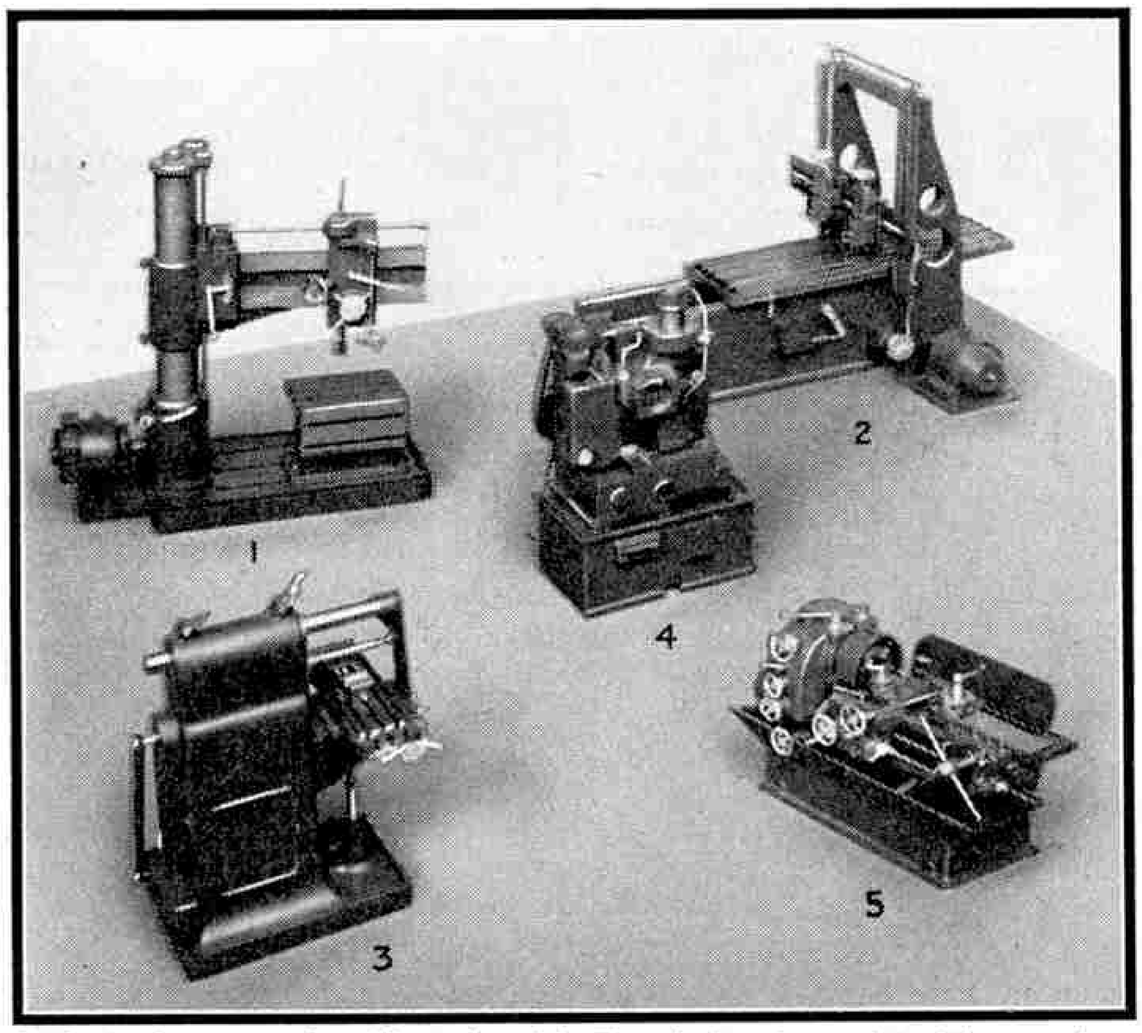
This conundrum can be solved very simply, however. There is a small "feeler" under the barge, and this runs in a guiding groove on the bottom of the canal. This contrivance is effectively hidden by the water, which is darkened by a special chemical process.

The model depicts typical areas served by English canals, and part is industrial and part rural. The canal emerges from a hill tunnel into fields, trees, rustic paths and hedges, and passes on through the lock to the industrial district with its factories, loading yards and canalside wharfs. The two boats alongside the wharf in the process of lading are made faithfully to scale. One is a motor barge and the other a butty. There are also two bridges, one a humpback brick-built road bridge and the other, close to the lock, a modern metal overbridge, which allows a horse-drawn barge to pass down the canal without taking off the rope.

The working barge plying up and down the canal is a model of the latest type of Diesel-driven barge with a beam of 12 ft. 6 in. It moves at the rate of 10 in. per sec. in the model canal, and remains for 1 min. in the lock chamber, while the water level is changed by means of a concealed centrifugal pump and pipes beneath the water level.

The lock perhaps contains the most detail of the whole model. It is carefully picked out in blue brickwork, and the lock gates are made accurately to scale in non-ferrous metal. These are opened and closed by the attendant in charge of the model.

The small details on the model should give ideas to builders making scenic models of their own. The telegraph poles, gnarled tree stumps, stiles and fences are not difficult to make, and add greatly to the appeal of the finished model. It is surprising what a handy man can do with little material. Sponges will become trees, and ordinary towelling makes excellent grass.



An interesting group of machine tool models. These include 1, a radial drilling machine; 2, a planing machine; 3, a milling machine; 4, a Drummond gear cutting machine; and 5, a Drummond capstan lathe of the latest pattern.

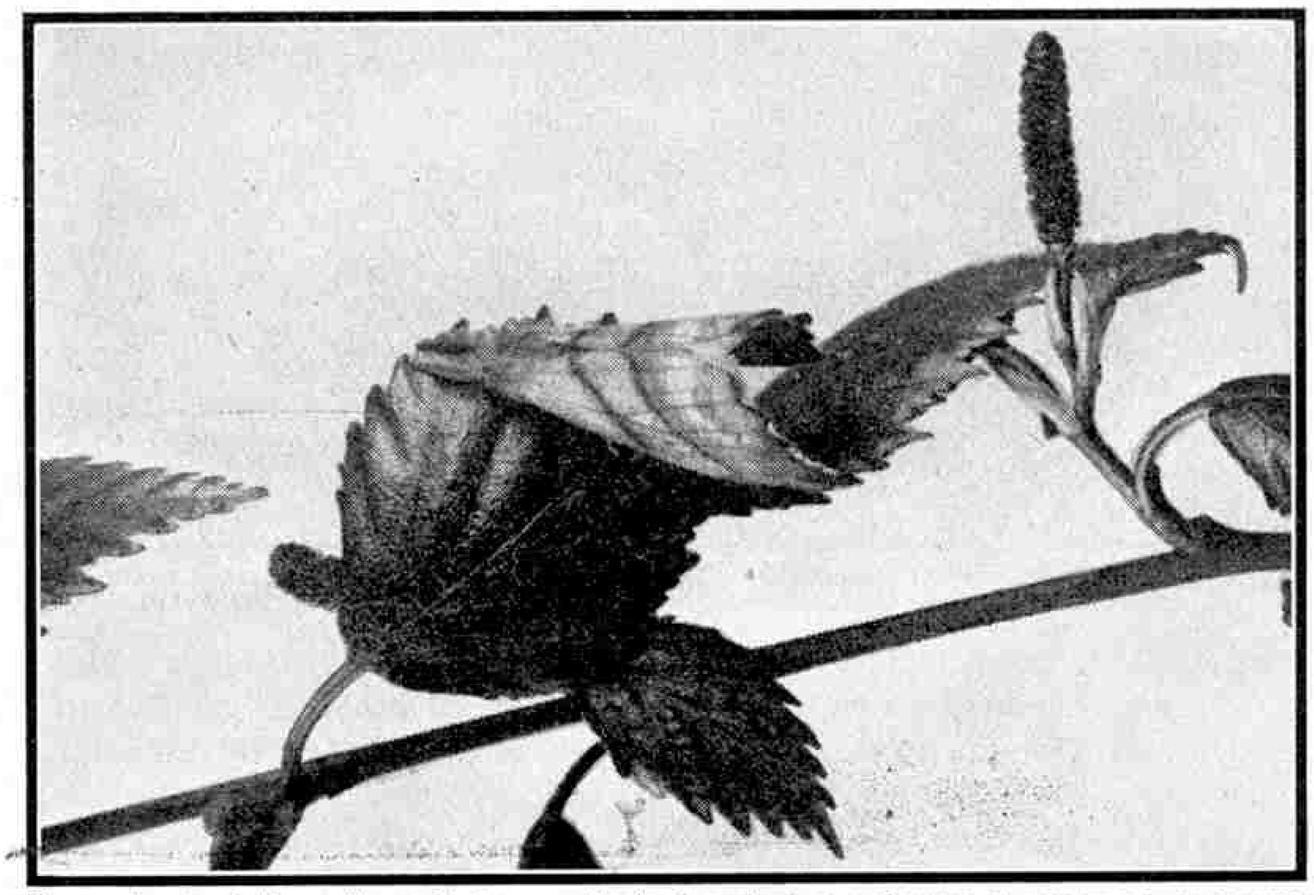
How Insects Protect Themselves

Caterpillars that make Gas Attacks

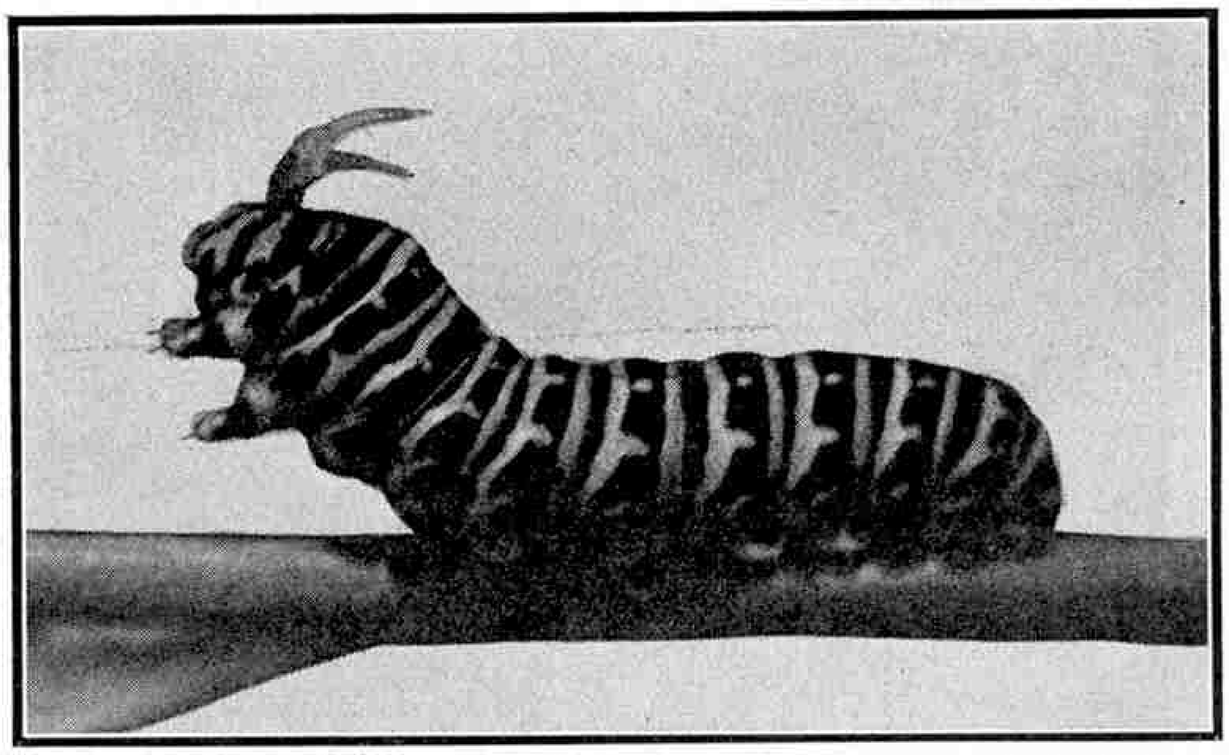
By L. H. Newman

SCIENTISTS know for a certainty that insects have not the slightest glimmerings of intelligence, for which the construction of their brains are not elaborate enough. Some of their actions and apparent forethought certainly are marvellous, and one can be deceived into believing that they think out each ingenious plan to protect themselves from enemies. Actually their measures are simply the result of inherited instinct, but many who saw for themselves some of the little everyday incidents in insect life described in this article would shake their heads, and say that the scientists have made a mistake in this case.

For instance, it might be supposed that the great care with which a female butterfly or moth protects its eggs is due to deliberate planning. In a wood where the silver-washed fritillary butterfly is common it will be seen that the female tucks her eggs into the crevices of the bark of a tree trunk. Now why does she do this, when the caterpillars eat violet leaves, which are growing round about everywhere? The reason is that the eggs hatch a few days after they are laid, and the tiny caterpillars go into hibernation straight away without feeding. So the tree trunk is a wonderfully secure place for them during the winter. On the first warm sunny day in spring the hungry caterpillars crawl out on to a projecting piece of bark, and are carried to the ground by a puff of wind. It does not really matter if they do not find a violet plant at once, for they have been fasting all the winter and one or two days more won't matter.



The scallop hook-tip moth, which has peculiarly shaped wings and when at rest on a twig of silver birch resembles one of the leaves of this tree.



The swallow-tail caterpillar throwing out its horns. Eight plates were exposed before this swift movement was caught, although the exposure was 1/250 sec.

Another extraordinary example of parental care in insect life is when the gold tail moth lays her eggs. After she has deposited a batch she rubs her hairy tail all over them while they are still moist and slightly sticky, concealing them admirably from the eyes of hungry birds.

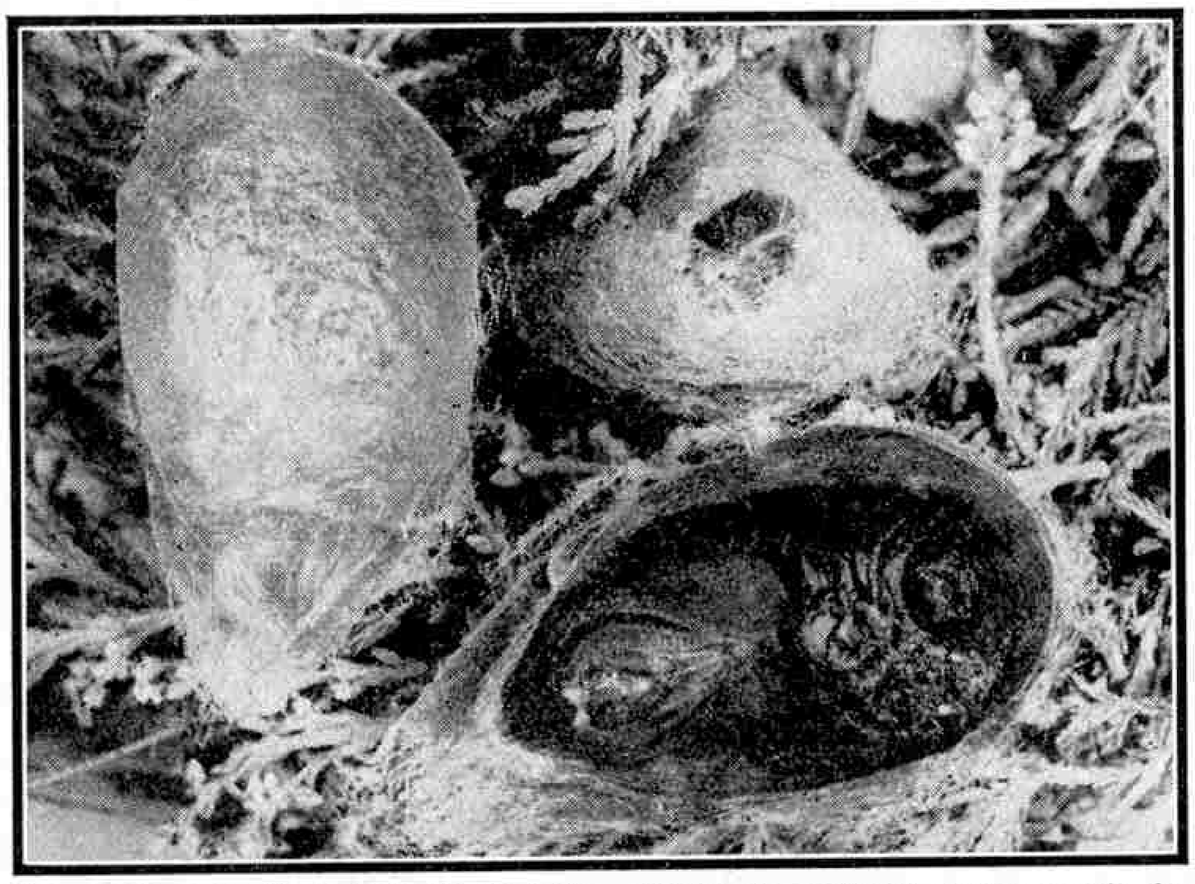
There are dozens of cases of British caterpillars that have protective colouration, or bear remarkable resemblance to their food plant, but the real interest lies in watching their reaction at any sign of danger. One instance is provided by the caterpillars that I used to call "loopers" as a boy. When at rest they look exactly like a stick or twig, even to tiny warts and humps on their backs to match the buds. When they are feeding or walking from one branch to another they can easily be found, but when the tree is touched they at once stretch themselves out taut and remain absolutely motionless. Then each not only looks like a twig, but actually behaves like one.

One of my favourite examples of this kind of thing is seen in the early life of the Essex emerald moth. I often wonder if the War Office got their ideas of camouflage from this insect. As soon as the caterpillar hatches from the egg it breaks off fragments of the leaves of the sea wormwood on which it feeds, and carefully fixes them between hooked spines all along its back. When the time comes for it to cast its skin, it instinctively crawls into the thickest part of the plant until it has had time to make a "quick change" and recover its new coat. One would almost think that it realises how conspicuous it would look when it was naked.

The opposite extreme in instinct is the type of caterpillar that is aggressive and declares war on its enemies. The swallow-tail caterpillar anticipated man in the use of "gas" attacks for warfare. At the top of its head are glands that secrete a strong acid, which it distils from the juices of its food plant, and whenever danger necessitates it shoots out two gelatinous horns that emit pungent fumes. It is easy to imagine the effect this would have on any of the parasitic flies or wasps that attack these caterpillars for the

purpose of depositing eggs on their bodies.

There is another caterpillar that is even better protected from these ichneumons, as they are called. The puss moth can throw out a tiny jet of formic acid, as I have learnt from bitter experience when handling them, for I once got some in my eye. It also resorts to "frightening behaviour" when a bird passes too close to the leaf on which it is feeding. I have flapped the pages of a magazine close to one of these caterpillars to watch its reactions. First it raises its tail-ends, from which a pair of thin pink threads project, and in the same moment it commences to lash about with them in a furious manner. While doing this it draws in its head, and the top segments, which have the appearance of two glaring eyes, become hugely inflated and indeed present quite a terrifying spectacle, even to a human being.



The cocoon of the Emperor moth caterpillar, showing the protected emergency exit. An interesting experiment with this cocoon is described in this article.

There are other caterpillars that seem to believe in the old saying "safety in numbers," for they spend their lives in colonies, often weaving a web of silken threads as their home. At times I think these "families" seem almost human in the way they come out to sun-bathe on this comfortable platform they have built for themselves. At night they use it as a tent under which to shelter, and it serves also as their "dressing room" when they have to cast their skins as they grow out of them.

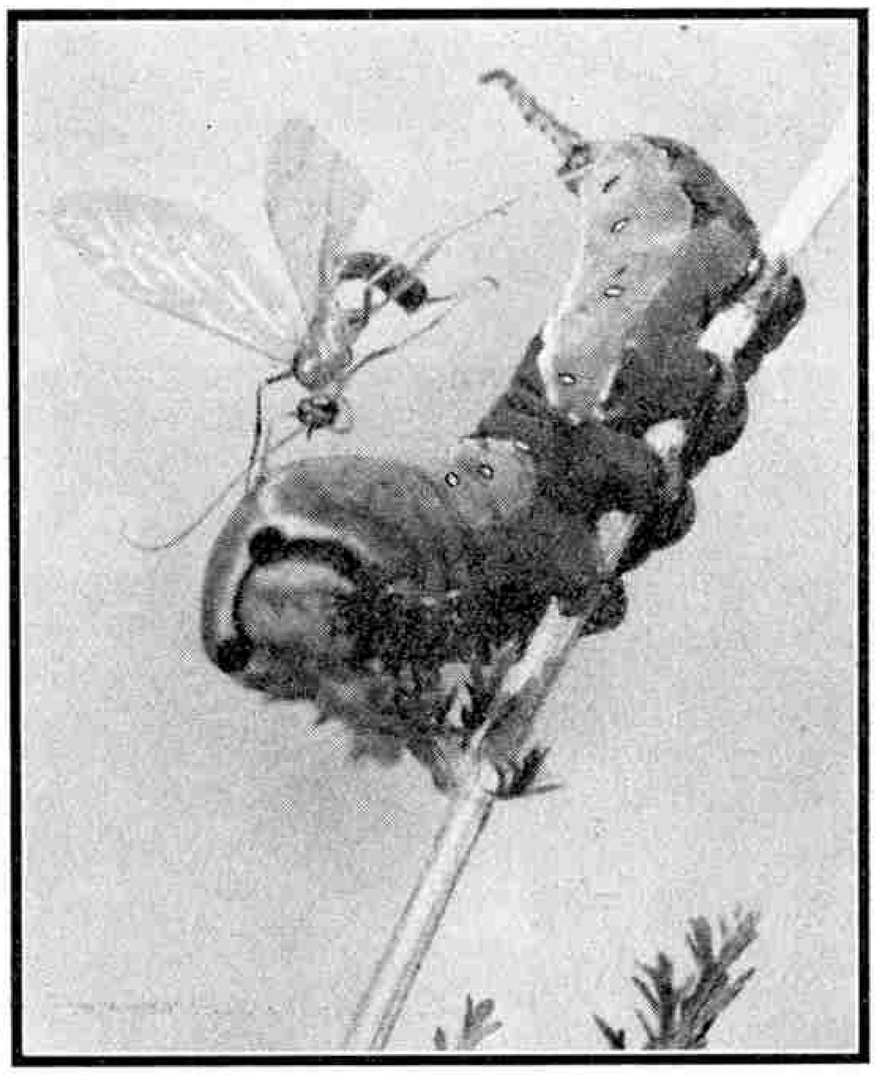
Some caterpillars have no protective devices to help them in the battle of life, but these usually have "warning" colours to warn the birds that they are not good to eat. Others have thick coats of hair as protection from birds, but I know that this does not deter that old gourmand the cuckoo from making a good meal off them, for I have watched one of these birds feeding ravenously on a colony of marsh fritillaries, and all their wriggling and twitching did not appear to put it off its feed a bit.

It is often only in the adult stage of insect life that we get an opportunity to watch some of the more remarkable ingenuities of our butterflies and moths. There are dozens of different species of moths that in the daytime sit about on fences and tree trunks defying detection because the markings on their wings so exactly resemble their surroundings.

I wonder if any reader has ever disturbed a red under-wing moth off a fence in the daytime, and watched it flying about in a pitifully bewildered manner, glaringly conspicuous, because of its bright coloured under-wings. It is never noticed when it is sitting on the fence with its top wings folded over the under ones. I have often disturbed these large moths purposely, as I hope to "catch one of them out" one of these days, but so far I have not succeeded. Every time they go to settle down again they flutter along the fence first, as though searching for a suitable site to rest. Sure enough they always pick the right spot and when I find them are cunningly concealed, even to the matching of the graining of the wood with the zigzag markings down their wings.

Just to dispel any doubts there may be about the reasoning powers of our insects, I will describe a little experiment I made with the Emperor moth while it was building its cocoon. The construction of this moth's cocoon is undoubtedly the most wonderful in the world. At the front end, from which the moth will eventually emerge, the caterpillar builds a series of palisades arranged so that no enemy can possibly force an entrance, but affording easy exit for the moth when the time comes for it to leave.

I waited until the cocoon was about half built, and then I snipped off all the elaborate part in the front without harming the caterpillar or otherwise damaging the cocoon. I expected the caterpillar to expend most of its energies and "building material" to repair the damage, but it did nothing of the kind. Instead it carried straight on from where it had left off when I disturbed it by picking up the cocoon. It continued to waste precious silk and gum from its mouth in strengthening the back and sides of the cocoon, and only gave the front opening the few strands of silk due to it. In other words the insect showed itself to be completely lacking in discernment or intelligence.



A puss moth caterpillar attacked by an ichneumon fly.

Instinct is really like a piece of intricate machinery. Everything happens with great regularity according to plan. Every moth of a species uses the same tactics, for generation after generation, and this in itself gives a clue to their lack of thought, which, if it existed, would surely cause a variation of their habits. But this does not make the living miracles our insects perform any less wonderful and their many ways of protecting themselves from enemies, whether by hiding or by vigorous counter attack, will always arouse the greatest interest.

THE NEW MECC

Every model new... Every Outfit enlarged!

BOYS, HERE IS THE TOY Y

Meccano, the world's greatest toy, is better than ever this all the Outfits have been enlarged, so that bigger and more Manuals of Instruction have been revised from end to end. All been withdrawn and replaced by new models. These have the wonderful possibilities of Meccano as they have never b

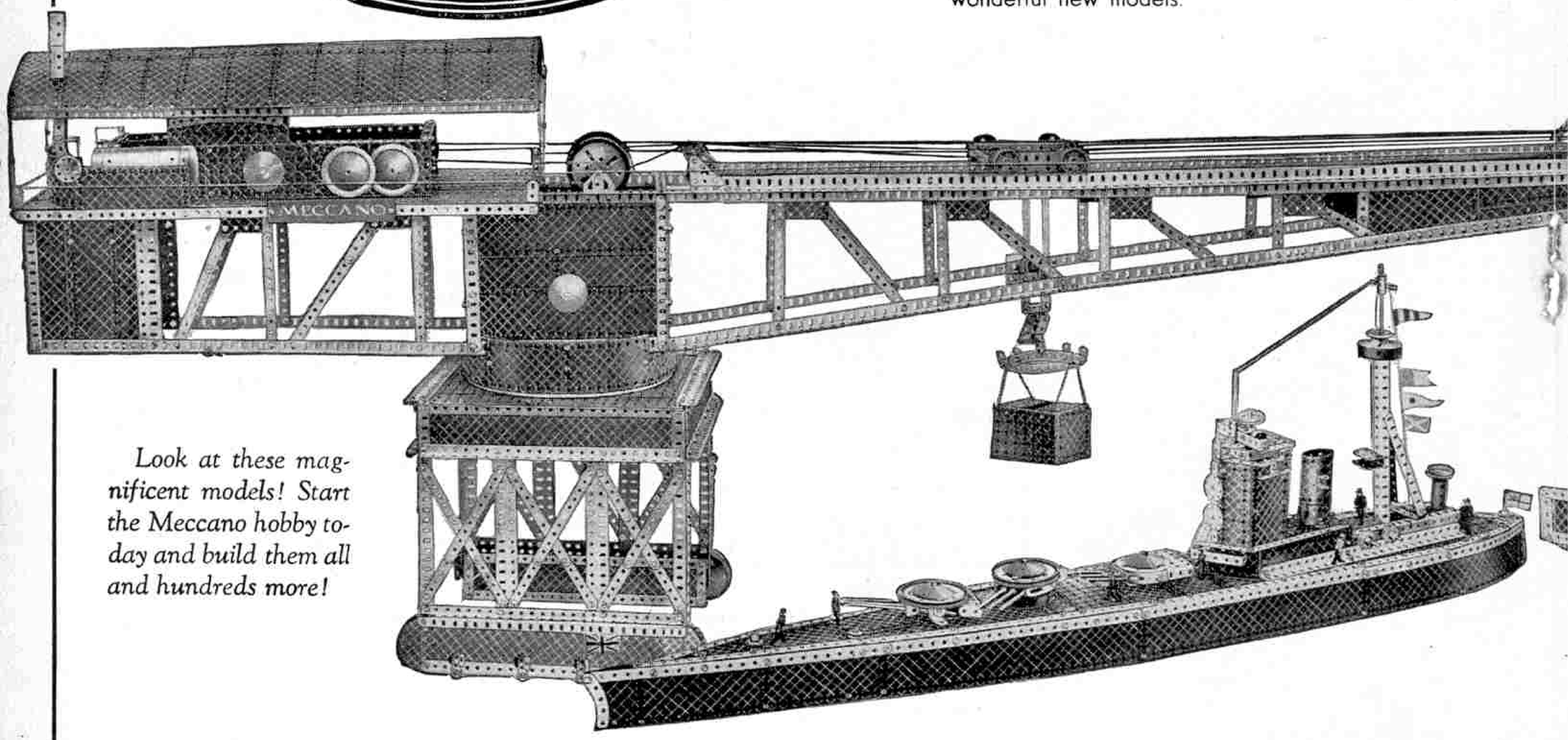
NO MORE DULL EVEN

With a Meccano Outfit and a Meccano Clockwork or Elec the past. There is no end to the number of playtime models th excitement of building a model, adding part after part until engineering in miniature. Then comes the thrill of setting the Motor, and watching it work away at full speed exactly like the be taken to pieces and the parts built up into a different struct

FUN FROM THE VERY BEG

There is nothing difficult about Meccano. The illustrations i what is to be done; and the only tools required, a screwdrive the Outfit. The fun begins as soon as the box is opened!

Every boy who already has a Meccano Outfit must see the 1937 Manuals. He will be amazed at the wonderful new models.



Look at these magnificent models! Start the Meccano hobby today and build them all and hundreds more!

Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 1

CANO!!

YOU ARE LOOKING FOR!

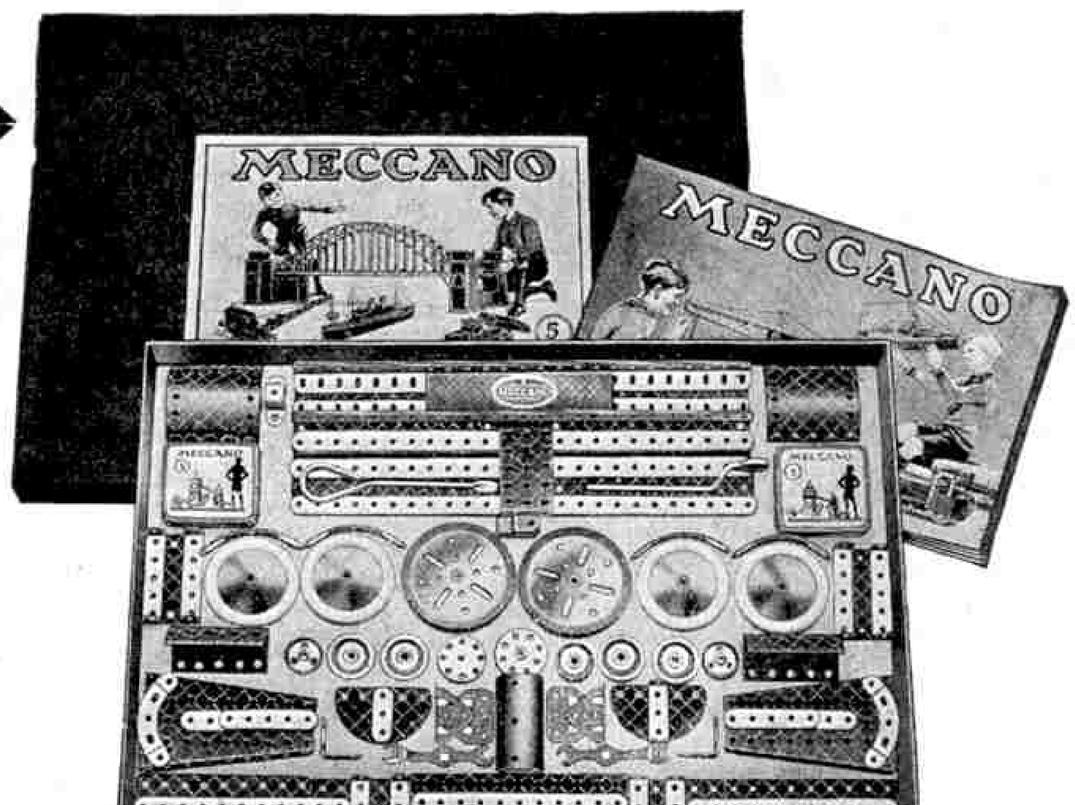
this season! New parts have been added to the System, and more realistic models can be built with each one. The Meccano All the old models—except a few established favourites—have ive all been specially designed and constructed, and show er been shown before. Nearly all the models actually work!

VENINGS

Electric Motor dull evenings are a thing of ls that can be built. First of all there is the until there appears a complete piece of the model in operation by means of the the real thing. Afterwards the model can ructure. Something new every day!

BEGINNING

ons in the Instruction Manuals show exactly driver and a spanner, are also included in



COMPLETE OUTFITS

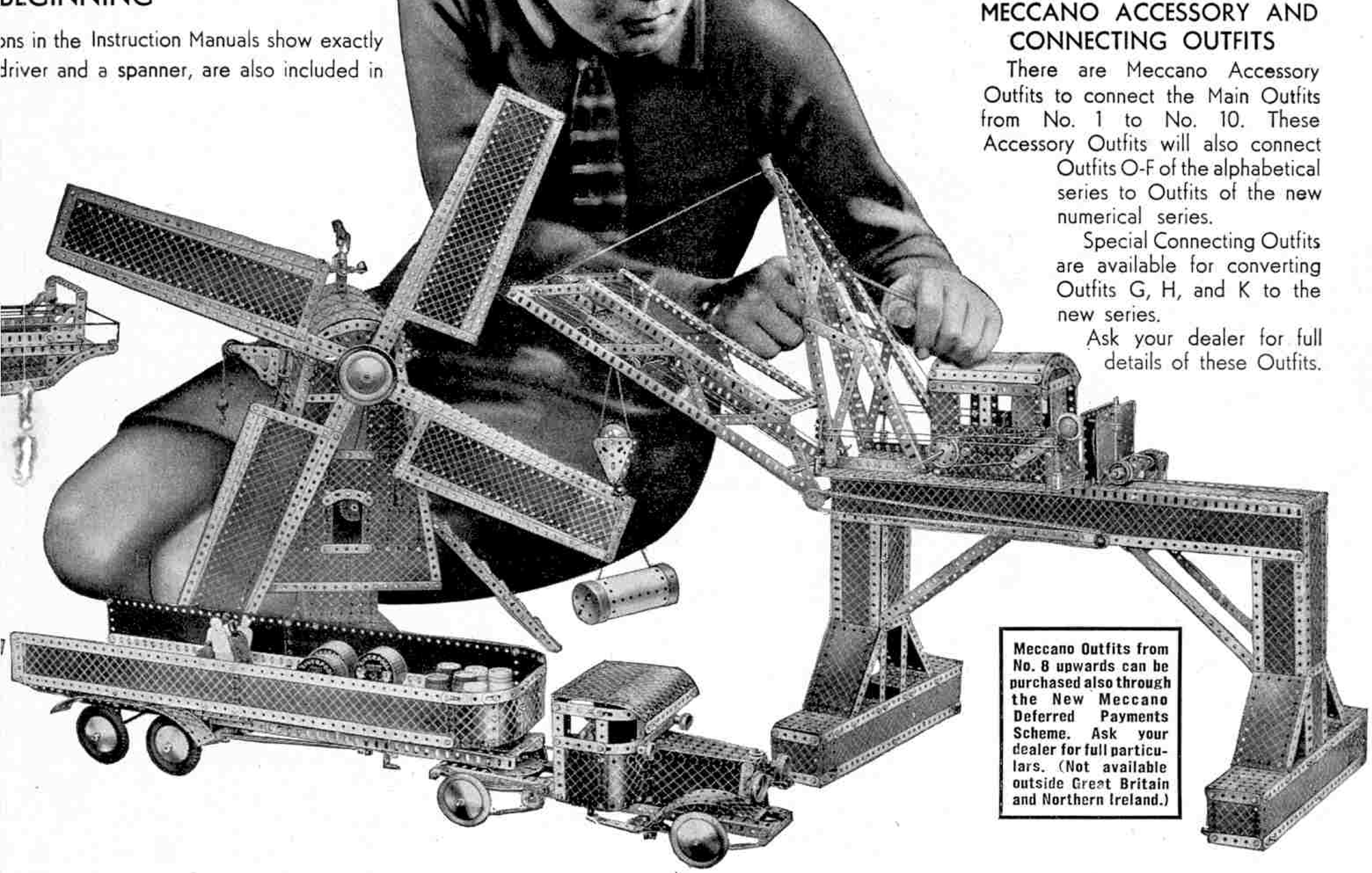
	s.	d.		s.	d.
No. 0 Outfit	2	6	No. 6 Outfit	20	0
No. 1 „	3	6	No. 7 „	30	0
No. 2 „	5	0	No. 8 „	55	0
No. 3 „	7	6	No. 9c „	80	0
No. 4 „	10	0	No. 9w „	105	0
No. 5 „	15	0	No. 10 „	231	0

MECCANO ACCESSORY AND CONNECTING OUTFITS

There are Meccano Accessory Outfits to connect the Main Outfits from No. 1 to No. 10. These Accessory Outfits will also connect Outfits O-F of the alphabetical series to Outfits of the new numerical series.

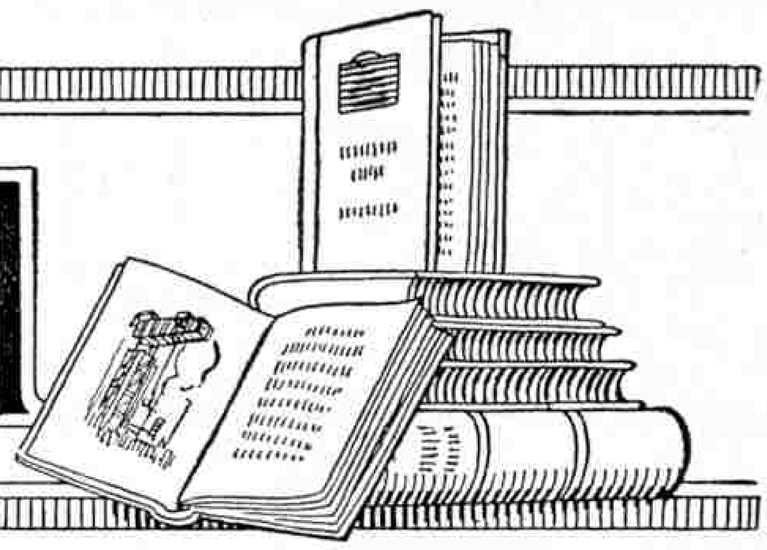
Special Connecting Outfits are available for converting Outfits G, H, and K to the new series.

Ask your dealer for full details of these Outfits.



Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Not available outside Great Britain and Northern Ireland.)

Books to Read



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/– for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"Communication has been Established"

By A. J. H. Goodwin. (Methuen. 10/6 net)

The story of man's efforts to evolve better means of transporting himself and his belongings from place to place, whether in search of food or trade, or simply out of curiosity, is a fascinating one, well told in Mr. Goodwin's splendid book.

To begin with man used Nature's roads, travelling along animal tracks and through passes cut by rivers, almost entirely in search of food. Later he began to select his paths so that he could exchange his own commodities for those of others, and little by little the great prehistoric trade routes were built up. The next step was the introduction of animals as beasts of burden. Herds of wild animals probably were first rounded up simply for food, and when it was realised that the horse, the dog, the camel and other creatures could carry loads, each was employed in surroundings for which it was specially fitted. Then came the sledge and the wheeled cart. Contrary to the accepted idea, the author believes that the wheel developed independently, and not from the roller, or a disc cut from a tree trunk, and gives convincing reasons for his belief.

Man was learning also to find his way about by water. He showed great skill in shaping the available material into craft of various kinds, and readers will follow with keen interest the story of their development in the Mediterranean and elsewhere into vessels in which explorers and traders travelled safely over the oceans. Then follows the romance of the silk roads of Asia and of the trade routes across the Sahara Desert. The wonderful roads built by the Romans are next described, and the work ends with accounts of primitive methods of conveying news and of the growth of written communication.

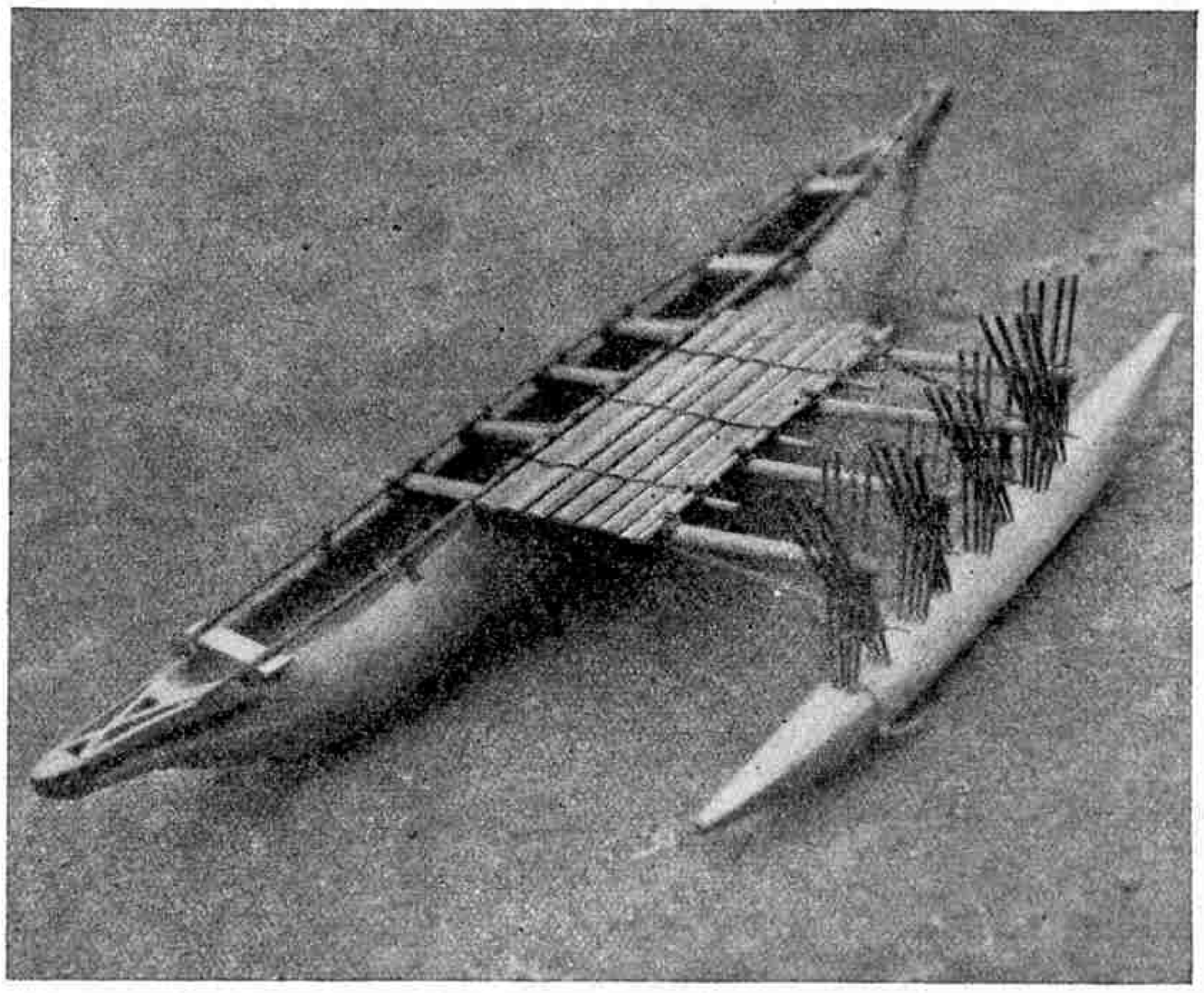
Mr. Goodwin's story is a complete and well balanced survey, packed with interesting examples of methods of communication of all kinds from all parts of the world. Famous roads and trade routes are shown by means of sketch maps, and there are 15 text illustrations and two plates.

"Flags of all Nations"

(Brown, Son and Ferguson. 1/6)

This new edition of Browns' "Flags of all Nations" incorporates the many changes made during the last few years. The flags are shown in colour on a large folding sheet with a cover, and include reproductions of 316 national flags, of which 70 are British, together with pilot flags, the new international code of signals and the flags of the British Royal Yacht Clubs. It is easy to find any flag required from an index, conveniently placed on the back of the sheet, which is seen immediately the cover is opened.

A special edition mounted on cloth is published at 10/6 for hanging in schools or offices.



An outrigger canoe from the Solomon Islands. This is the most efficient type of canoe used in the Pacific. From "Communication has been Established," reviewed on this page.

"King Arthur and his Knights"

By Blanche Winder. (Ward Lock. 3/6 net)

Younger readers will enjoy these stories of King Arthur and the Knights of the Round Table, here retold for them by Miss Winder. Each story is complete in itself. The series begins with the boyhood of Merlin, the great magician, the founding of the Round Table and the coming of Arthur, and continues to the break-up of the famous brotherhood and the passing of its chief. By means of these well-selected adventures and episodes the book gives a complete account of the great British legend.

The book is printed in very readable type, and 24 excellent colour plates by H. G. Theaker add to its attractions.

"My Jungle Trails"

By A. Hyatt Verrill. (Harrap. 12/6 net)

Nobody knows the jungles of Central and South America better than Mr. Verrill, who has spent a lifetime in exploring them in the search for strange creatures of all kinds. He has had encounters with dangerous animals, Indians, bandits and revolutionaries, and is able to describe his adventures in a fascinating style. His latest volume is a collection of stories of strange and exciting experiences that will hold the interest of his readers from cover to cover.

Mr. Verrill's first story deals with his visit to a lost gold mine in Panama, the secret of which was carefully guarded by Indians in order to prevent the coming of more strangers and tyrants. Then follow hair-breadth escapes from starvation, and from death by the parting of a rope while exploring caves, and strange tales of Obeah and Voodoo, the black magic and serpent-god worship brought to the West Indies by negro slaves from Africa. Stories of jaguars thrill the reader, and from the exploits of these creatures it is easy to realise how formidable they are and how well founded is the fear of them shown by natives.

Many interesting Indians, negroes, white settlers and murderers pass for a few moments through Mr. Verrill's story. The author enjoyed the hospitality of Indians who were experts on the making of "curari," a terrible deadly poison with which they tipped the arrows they shot out of their blow-guns. He discovered Indians who spoke Elizabethan English, probably learned from English castaways of centuries ago; and passed through a revolution in Hispaniola when searching for a missing link of the animal world. During this search he was treated with the greatest courtesy and consideration by both sides, who were always prepared to suspend operations when he appeared on the scene. Once he was very nearly drowned while crossing rough seas 25 miles in width in an overloaded canoe, and on another occasion he spent the night as the honoured guest of a bloodthirsty bandit, who actually gave him information that led eventually to the capture of a living specimen of the very rare creature for which he was looking.

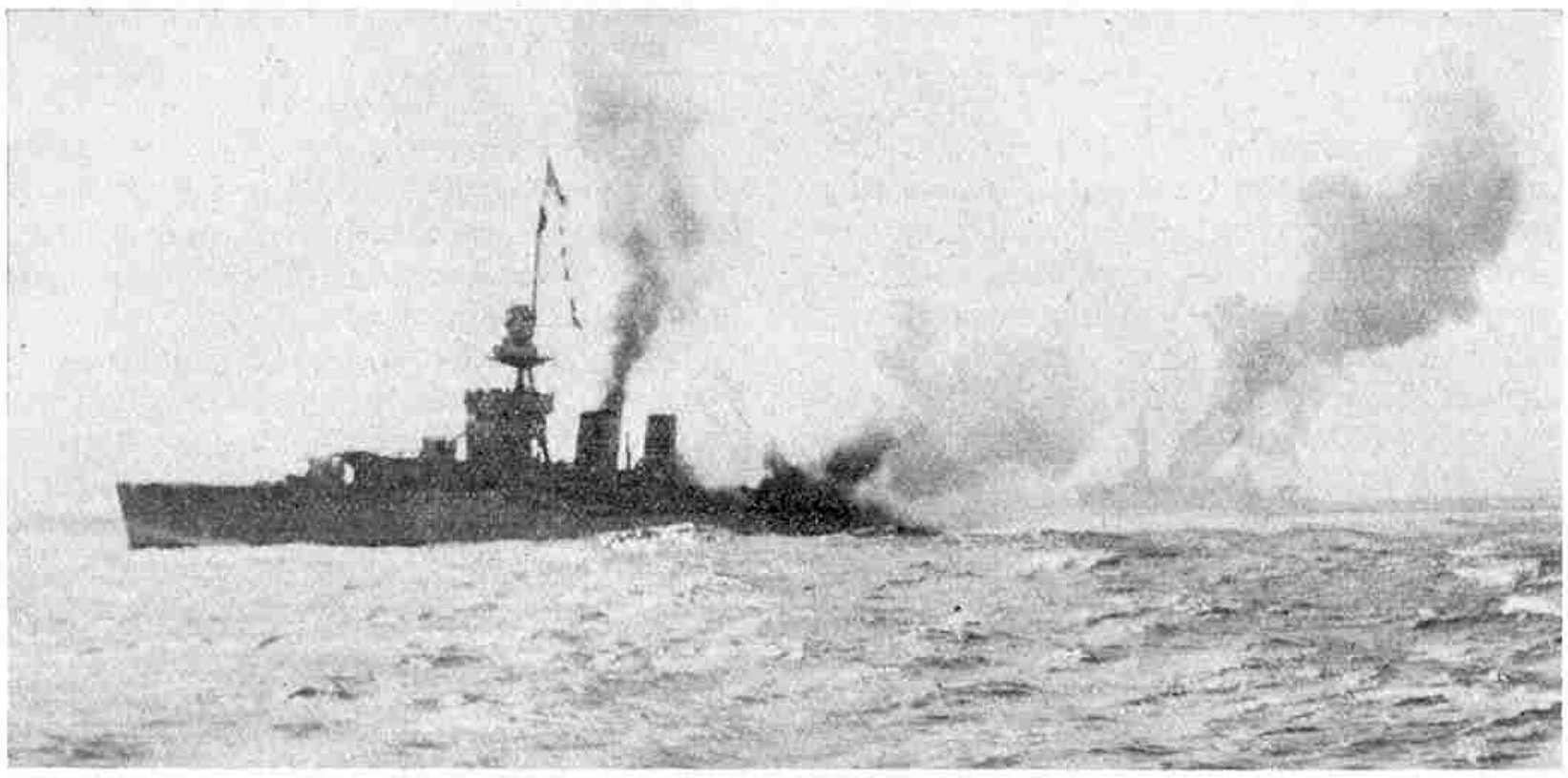
The book is well illustrated by means of a frontispiece and 23 full page plates.

"The Wonder Book of Daring Deeds"

(Ward Lock. 5/- net)

Here is a book packed with true stories of heroism and adventure, and there will be few boys who will not find every story of enthralling interest. It begins well with an account of Scott's great journey to the South Pole, and this is followed by tales of other heroes, such as Lawrence of Arabia, the men who manned the mystery ships of the Great War, and those who fought the Zeppelins. How an oil well fire was tackled, and how the world's altitude record was achieved, are thrillingly told, and the other stories include accounts of life in the Foreign Legion, and of narrow escapes and desperate deeds in all parts of the world.

The book is splendidly illustrated, with photographic illustrations on every page and eight full page plates in colour.



A "C" class light cruiser in action at Coronel. From "The Wonder Book of Daring Deeds," reviewed on this page.

"Obstruction—Danger"

By J. Thomas. (Blackwood. 5/- net)

Railway disasters form perhaps a somewhat unusual subject for a book by a railway enthusiast. The author's aim, however, is to remind readers of the ingenious safety methods adopted on railways. The accidents he describes in a sense illustrate how effective they are, for they were the result of very unusual circumstances, and certainly were remarkable for the thrills that accompanied them.

First place is given in the book to the epic of the first Tay Bridge. This was a tragedy of bridge building rather than of railway working, but the rest of the book is devoted to railway calamities. They include stories showing how fog, snow and storms affect railway safety, and tales of heroism on the footplate, and on the part of passengers and railwaymen alike are bright spots in them. In all cases the author is careful to make plain the reason for the disasters he describes, and to show how each in turn has taught a lesson in safety. For example, the failure of the old Tay Bridge resulted in the abandonment of the original plans for the Forth Bridge, and in the design of the present structure on much more massive lines.

It is to be regretted that the book contains so many inaccuracies, which a little care would have avoided. It recalls for the benefit of a younger generation some of the disasters of years ago, however, and will be read with keen appreciation by all interested in railway travel.

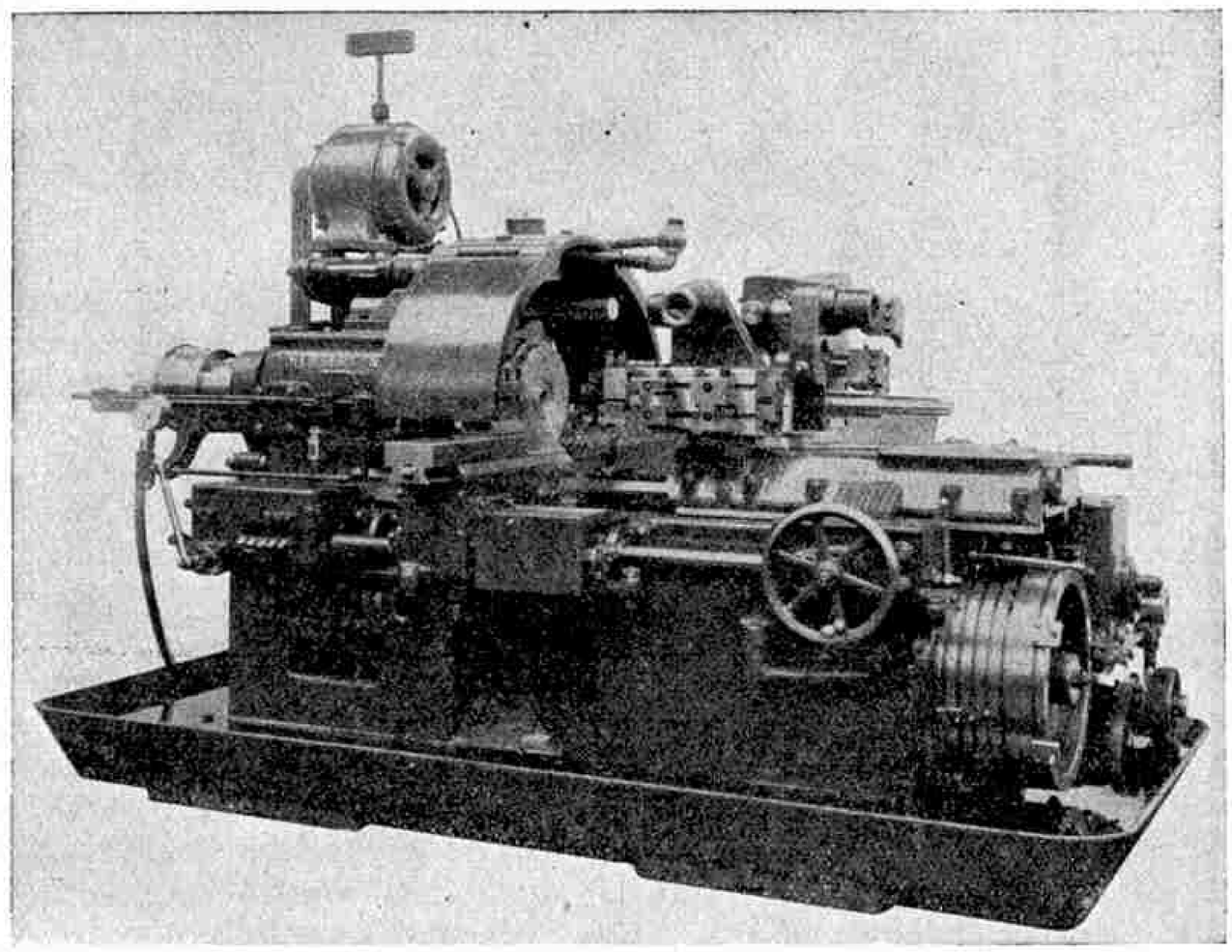
"Cigarette Cards"

By I. O. Evans. (Herbert Jenkins. 3/6 net)

In recent years there has been a remarkable increase in the popularity of cigarette cards. Few realise how greatly they have been developed, however, and still fewer know how much trouble is taken to produce them, or the many interesting uses to which they are put. Mr. Evans' book tells the whole story and will be a revelation to many of his readers.

The earliest cigarette cards came from America, where they were in use more than 50 years ago. Even in those early days they were issued in complete sets showing flags, native chiefs, dogs of the world, birds, lighthouses, ships and many other subjects of present day cigarette cards, and albums were designed to contain them. A few years later they appeared in this country, where they were introduced as stiffeners and at first were blank.

From the history of cards Mr. Evans turns to their subject matter. Details are given of curious sets among the many thousands that have been produced, and guidance is given on storing and classifying cards. There is a frontispiece in colour in addition to 16 full page plates.



A modern auto-lathe. From "A Hundred Years of Mechanical Engineering," reviewed on this page.

"A Hundred Years of Mechanical Engineering"

By Edward Cressy. (Duckworth. 15/- net)

During the last 100 years the engineer has invented new sources of power and improved old ones, and given us many new metals and alloys. The story of these great achievements is told in full by Mr. Cressy, whose splendid book is packed with interesting and reliable information.

The first part of the book deals with the production and distribution of power, beginning with the reciprocating steam engine. The fascinating story of the steam turbine is then told, after which the author turns to the internal combustion engine and its development. Lastly comes a section dealing with water power, the revival of which has been a remarkable feature of the last 40 years, and its utilisation in great hydro-electric stations. The transmission of power is no less important than its production, and how this is carried out is fully explained in a chapter that also deals with ball and roller bearings, and with such refinements of modern engineering as the Michell thrust block.

The second part of the book deals with the engineer's materials and the tools he uses in shaping them. After tracing the discovery of various forms of iron and steel, and the introduction of other interesting metals and alloys, the author describes work in the foundry and forge, by means of which the raw metals and alloys are brought into forms suitable for making the finished article. For this purpose automatic lathes, planing, milling, boring and grinding machines and gear cutting devices are used, and the growth of these is traced from their crude beginnings.

Lastly we read of the manner in which power is applied. This part of the book shows the engineer at work on the road and railway, at sea and in the air, on the farm and underground. We see how he invented and perfected the motor car, the caterpillar tractor and the locomotive, which has increased in power and efficiency to an amazing extent during a century of railway working. Equally remarkable progress with marine and aero engines is described, and the story ends with interesting examples of the engineer's success in various fields in which he has replaced manual labour by mechanical effort.

The book is exceptionally well illustrated by means of 157 drawings and photographs.

A Notable Indian Locomotive Design

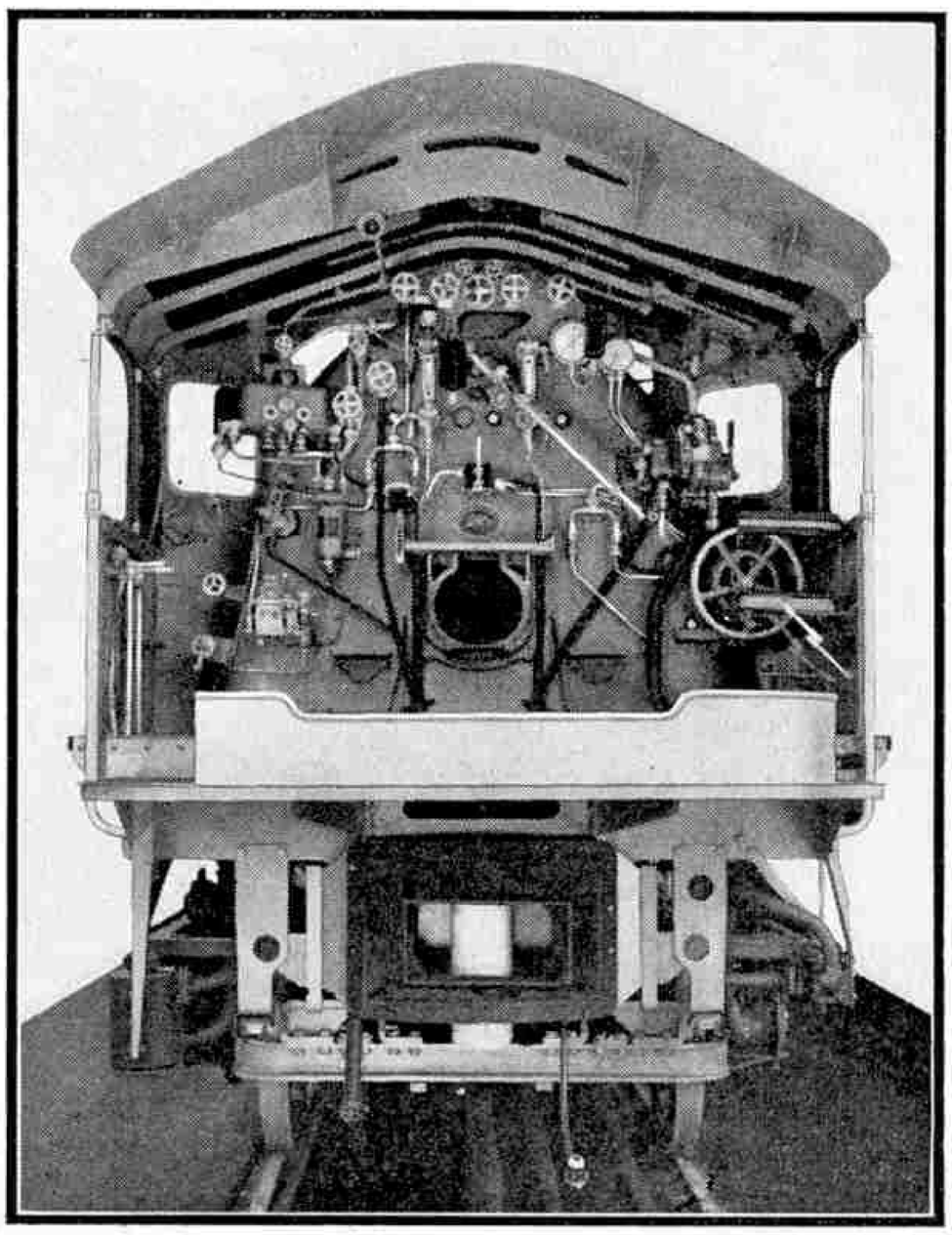
Special Features for Intensive Service

IN general the steam locomotives of the railways of India bear a strong resemblance to those in use in this country. This is not really surprising when we remember that the bulk of the engines for India have been supplied by British makers ever since the commencement of the Indian Railway systems. There can have been few better examples of the splendid steam locomotive produced in this country than two big "Pacifics" put into service this year on the Great Indian Peninsula Railway. These giants are Nos. 3100 and 3101, and the latter is illustrated on the next page. They have been built by the Vulcan Foundry Ltd., of Newton-le-Willows, Lancs., a firm founded in 1830 by Charles Tayleur and Robert Stephenson. Since their arrival in India Nos. 3100 and 3101 have been named "*King George VI*" and "*Queen Elizabeth*" respectively. In spite of their size, for the Indian standard gauge is 5 ft. 6 in., they have generally neat and well-finished outlines which plainly indicate the country of their origin.

These engines are intended for high-speed main line work, and the special point about their construction, which has had some influence in the details of their design, was that they should be capable of more intensive use than previous engines, and that they should at the same time be able to remain in service for longer periods between heavy overhauls. Such turns as the "*Punjab Mail*," for instance, between Bhusaval and Jhansi, a distance of 426 miles in each direction, with a turn-round time of only three hours, will give a mileage of over 850 in about 24 hours. India is a land of great distances, and the "*Punjab Mail*," which is one of the famous trains of that country, covers a distance of some 1,550 miles in a single journey. It runs between Bombay, the port for the English mail boats, and Peshawar, the important strategic centre on the north-west frontier.

The general design of these two locomotives, which are classified "XP," is similar to that of the existing "Pacifics" of class "XB." This class is one of the standard types evolved some years ago by a special committee of the Government of India Railway Board for service on various Indian lines, including the East Indian, Eastern Bengal and Great Indian Peninsula systems. In the main, therefore, the new engines follow principles of design that are well-tried in Indian railway practice, but they include various special features with the object of securing more intensive service, as explained previously. Further, to allow of comparison between various types of equipment there are certain details in which No. 3100 and No. 3101 differ from one another. Thus both are fitted throughout with roller bearing axle-boxes, but different makes of bearings are used.

Plate frames are used, as is usual in British-built engines, and there are two cylinders placed outside them, with a diameter of 21½ in. and a piston stroke of 28 in. Poppet valves and gearing are employed for the distribution of steam, and the fact that the gearing is inside the frames gives a very different appearance to the engines below the footplate as compared with some other modern locomotives. The use of poppet valves is not new to Indian locomotive practice, however. They were applied some years ago to two pairs of four-cylinder simple "Pacifics," also Vulcan products.



The cab of one of the 4-6-2 locomotives described in this article, with the special socket and pin for the tender draw-gear. For the photographs and the information in this article we are indebted to the Vulcan Foundry Ltd., of Newton-le-Willows, Lancashire.

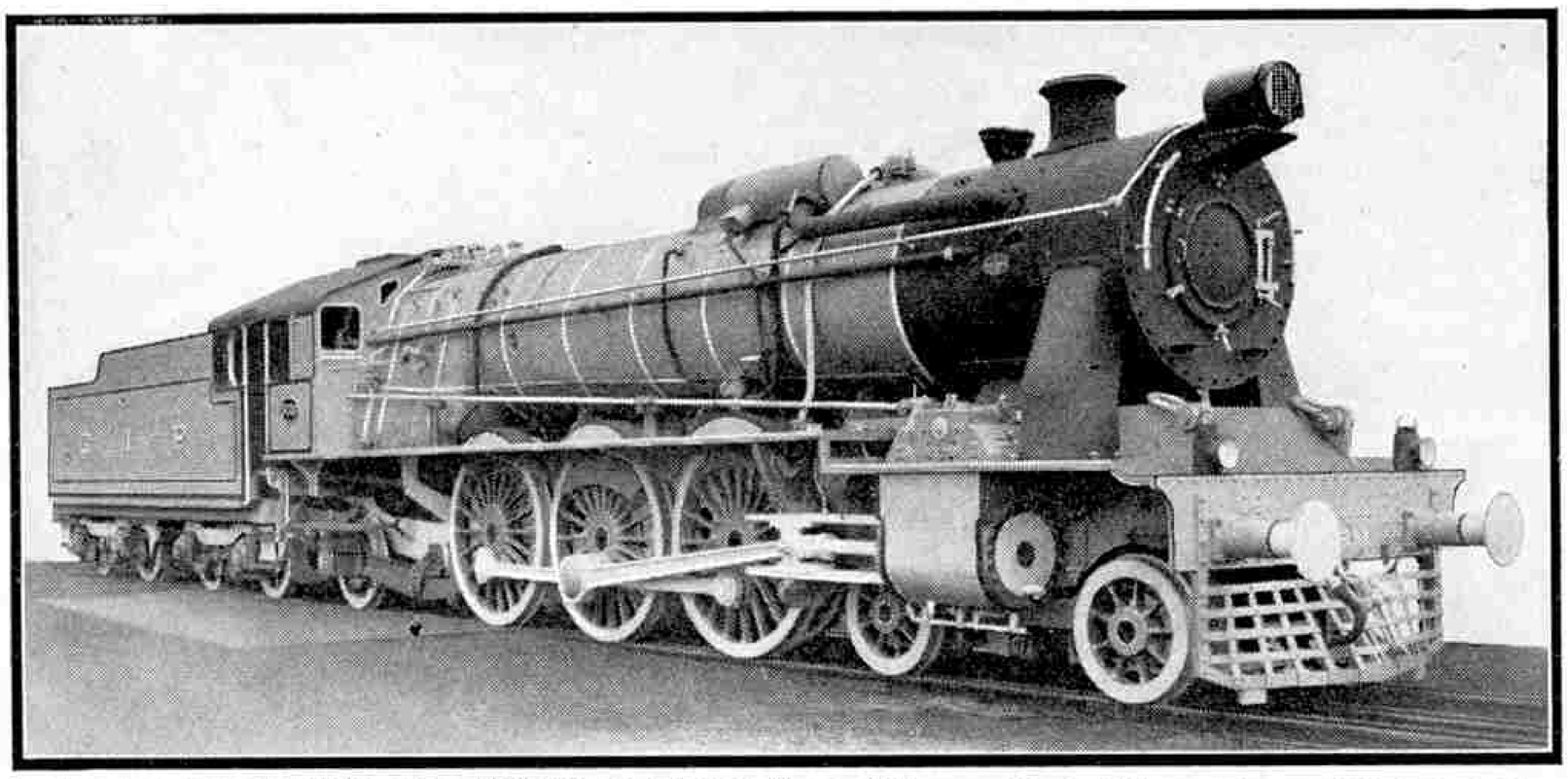
The drive is taken to the crank pins of the centre pair of coupled wheels, an arrangement that is almost invariably employed with "Pacifics." There is a difference in the design of the connecting rod big ends of the two engines. On No. 3100 bronze floating brushes, which are grease-lubricated, are used, and the big ends of the rods conform to the usual shape. Thus they are circular, except for the projecting squared portion that accommodates the greasing system. On No. 3101, however, roller bearings are fitted, so that the big end is enlarged to accommodate them. This feature is plainly seen on the upper illustration on the opposite page. Instead of being circular the big end is octagonal, and with its peculiar shape and its large size, together with the dished cover plate, has a very distinctive appearance.

Other parts of the motion in which there are differences between the two engines are the crossheads. The crossheads on No. 3100 are fitted with slippers of a special design. These are not fixed rigidly to the crosshead, and are arranged so that the bearing pressure between each slipper and its slide bar is uniform. On No. 3101 the crossheads do not include this feature.

The boiler provided is large, and each is fitted with a wide fire-box having the ample grate area that is necessary for burning the rather poor quality fuel that is used in India. The lower illustration on the next page, showing an interior view of the fire-box, gives some idea of its vast size. An interesting feature that is also apparent from the same illustration is the fitting of what are known as thermic syphons. These

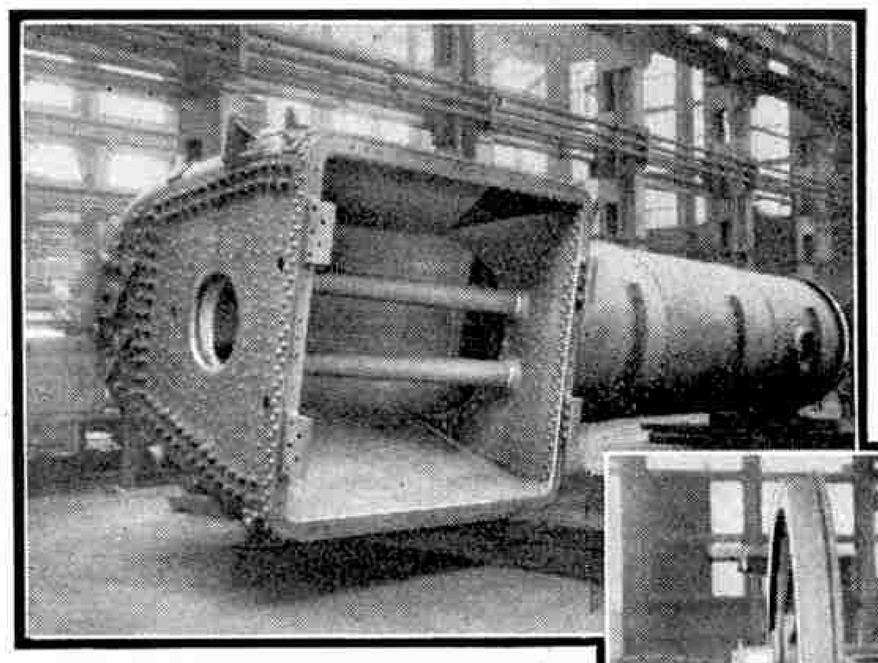
consist of large water tubes that connect the water space in the front of the fire-box with the water space above the crown sheet. The object of these syphons, which are widely used overseas, is to promote circulation. The front part of the inner fire-box is extended forward into the boiler barrel to form a combustion chamber.

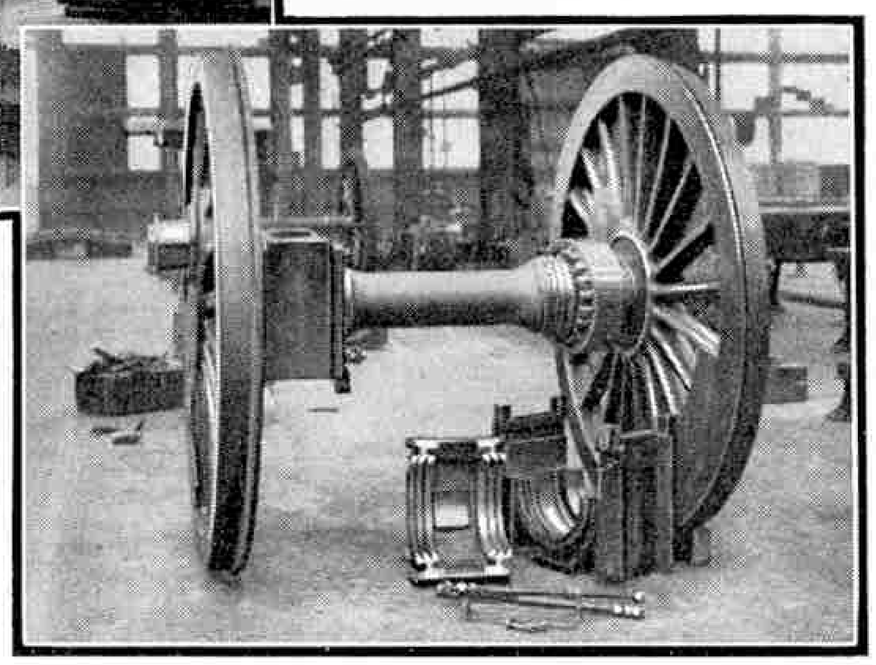
The boiler barrel has an outside diameter of 5 ft. 9 in. at its largest ring. The heating surface of the tubes and of the superheater flues amounts to 1,543 sq. ft. The thermic syphons account for 50 sq. ft., and with the fire-box heating surface of 192 sq. ft. the total evaporative heating surface amounts to 1,785 sq. ft. The superheater heating surface is 504 sq. ft. The boiler works at a pressure of 210 lb. per sq. in., and is relieved by three pop safety valves placed in line on top of the fire-box. Each locomotive has its boiler feed heated by means of the A.C.F.I. feed-water heating system, and part of the apparatus in connection with this can be seen on the boiler barrel in the illustration of No. 3101.



Great Indian Peninsula Railway No. 3101 "Queen Elizabeth," one of the new "Pacific" locomotives specially intended for intensive long-distance working. A remarkably neat and well-finished appearance has been secured in spite of the size of these engines, and the various gadgets with which they are provided.

The smoke-box is circular and is supported on a saddle casting. The arrangement of its front is interesting. The circular door provided is of comparatively small diameter, although quite large enough to allow of the removal of ashes and so on, and is secured by a number of rather prominent locking handles arranged round its rim. For major repair operations, such as attention to the tubes and so on, the whole of the front plate of the smoke-box with the door can be removed. Another characteristic piece of equipment is the headlight. The generator supplying current to this is mounted outside the boiler casing on the left-hand side of the engine.





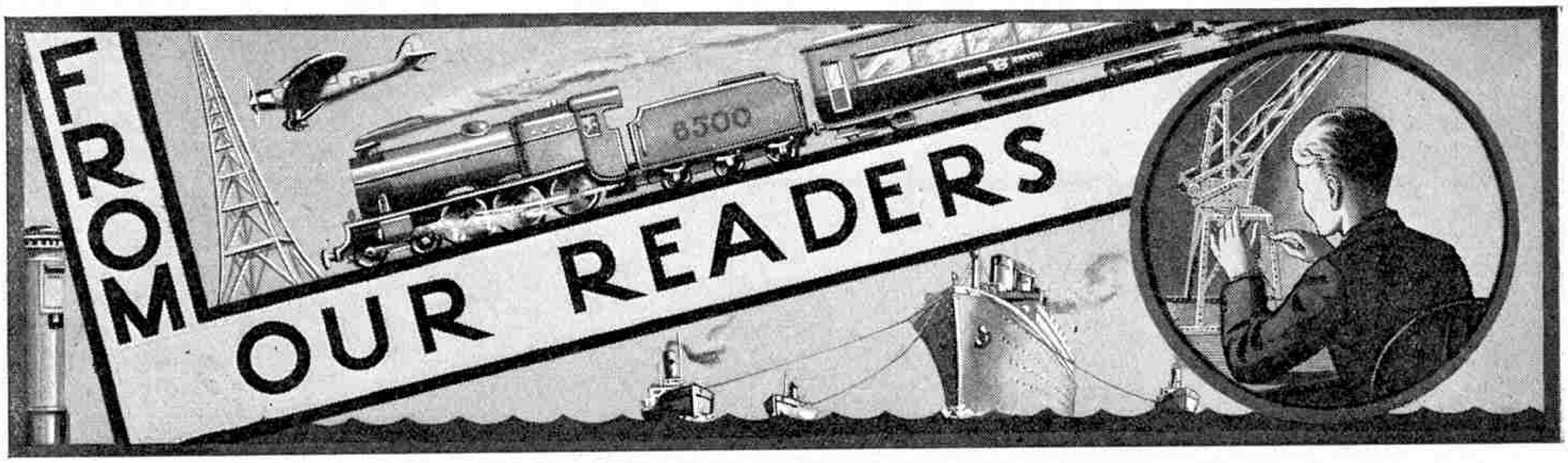
Interesting views taken during construction. (Above) The fire-box and boiler from an unusual angle, showing the thermic syphons inside the fire-box. (Right) A pair of coupled wheels showing a roller-bearing axle-box partly assembled.

The cab is very spacious as a result of the wide gauge, and a good idea of its general appearance can be gathered from the illustration on the opposite page. The front plate of the cab is not square across the engine, but is set at an angle on each side of the boiler in a somewhat similar manner to the arrangement seen on the latest L.N.E.R. locomotives.

The tenders provided are large, having a tank capacity of 5,500 gallons of water and accommodation for 13 tons of coal. These giant vehicles, which are carried on two bogies, weigh over 74 tons. They are provided with the cab at the front end that is usually fitted to tenders in India to protect the crews not only from the rays of the Sun, but also from the violent tropical rains. In the ordinary way the amount of movement between the tail of a 4–6–2 locomotive with a radial pony truck and a bogie tender would be considerable, but in these engines reduction of this oscillation has been aimed at by the provision of a special system of draw gear. This is known as the "Système Mestre," in which advantage is taken of the weight of the tender to control the oscillation at the rear end of the engine. A more rigid coupling arrangement than usual is employed; a casting that provides a vertical bearing projects from the front end of the tender and is carried forward into a corresponding recess at the rear of the engine. A large pin passes through the recess, and through the tender coupling also.

At the same time the platform or footplate of the engine is extended backwards over the tender underframe as far as the shovelling plate where the fireman obtains his fuel. The improved riding that results will be much appreciated by the fireman, as it gives him a much firmer stance. With the ordinary method of coupling it is difficult at times for the fireman to traverse the coal from the shovel plate on the tender to the fire-hole door, particularly if he has one foot on the tender and the other on the engine and has to preserve his balance between them.

Some locomotives in France are provided with an articulated connection between engine and tender. In Britain this arrangement is not used, but two L.N.E.R. "Atlantics" rebuilt a few years ago have the adjacent ends of the engines and their tenders supported on a single four-wheeled bogie.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

How the Pelican Catches Fish

The pelican is one of Australia's quaintest birds. It lives on rivers and swamps in the interior and on the coast. The accompanying photograph was taken after the bird shown had enjoyed his early morning dip.

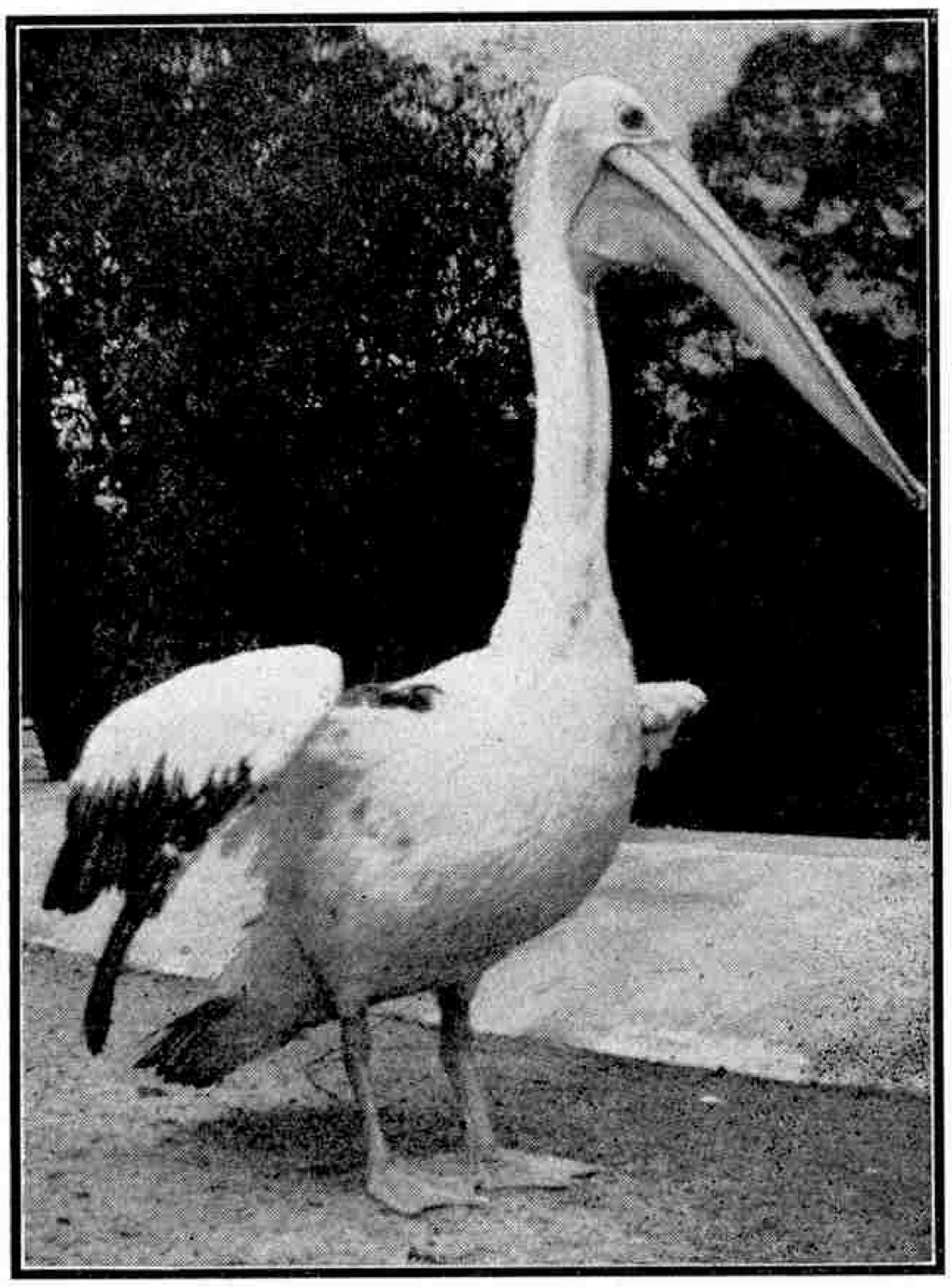
Among the curious habits of the bird is one that causes naturalists to ask "Do pelicans teach?" They can often be seen at nesting grounds gathered round one worthy, who with puffed-out chest seems to be lecturing to the community. Again, when out on fishing expeditions, pelicans invariably gather in a circle on the beach as if in conference, and then take off to make a flying attack in formation upon the unfortunate fish.

The pelican's pouch serves many purposes. It has a capacity of 20 gallons, and can carry about 16 lb. of fish. It makes a very effective fishing net. Water and fish are scooped up together, and the water spills out as the beak is closed, leaving the fish safely stored in the pelican's "larder."

The bird is an ardent fisher, and goes about his job in a very careful way. After spotting a fish, he slowly paddles towards it, with head resting on his back. Suddenly, with a swift downward movement, he snatches the fish out of the water and thrusts it into his pouch, or gobbles it right down. When he encounters a shoal of fish, he flies along the surface of the water and drives them into a bay or inlet, where he makes short work of them. His appetite is enormous. He eats as much food as would easily satisfy 12 men, and for this reason he is known among "bushmen" as the "river camel."

At one time the pelican seemed to be developing into a pilferer, and in consequence many of them were destroyed, but the bird is now protected by law.

K. E. ALLEN (Oatley, N.S.W.).



An Australian pelican poses for our reader K. Allen, New South Wales.

A Canadian Holiday

One of the most beautiful places I have ever visited is French River, Ontario, a small settlement in the Canadian wilds about 400 miles from Toronto. There the Canadian Pacific Railway have a camp, which is perched on top of a great cliff and commands a magnificent view of the River. Living at the camp are Indians who may be hired as guides when going exploring or fishing. These Indians are descendants of the natives who were so hostile to the great English and French explorers and pioneer settlers. To-day they are peaceful and friendly, and in summer live in their ancient wigwams, set along the barren shores.

The Sun goes down very early at French River, and the evenings are cold, with an inky blackness outside. Most people at the settlement then gather in the cheery lounge of the main lodge, where there is a roaring log fire. Some chat about the events of the day, and others just relax and enjoy the warmth in comfort.

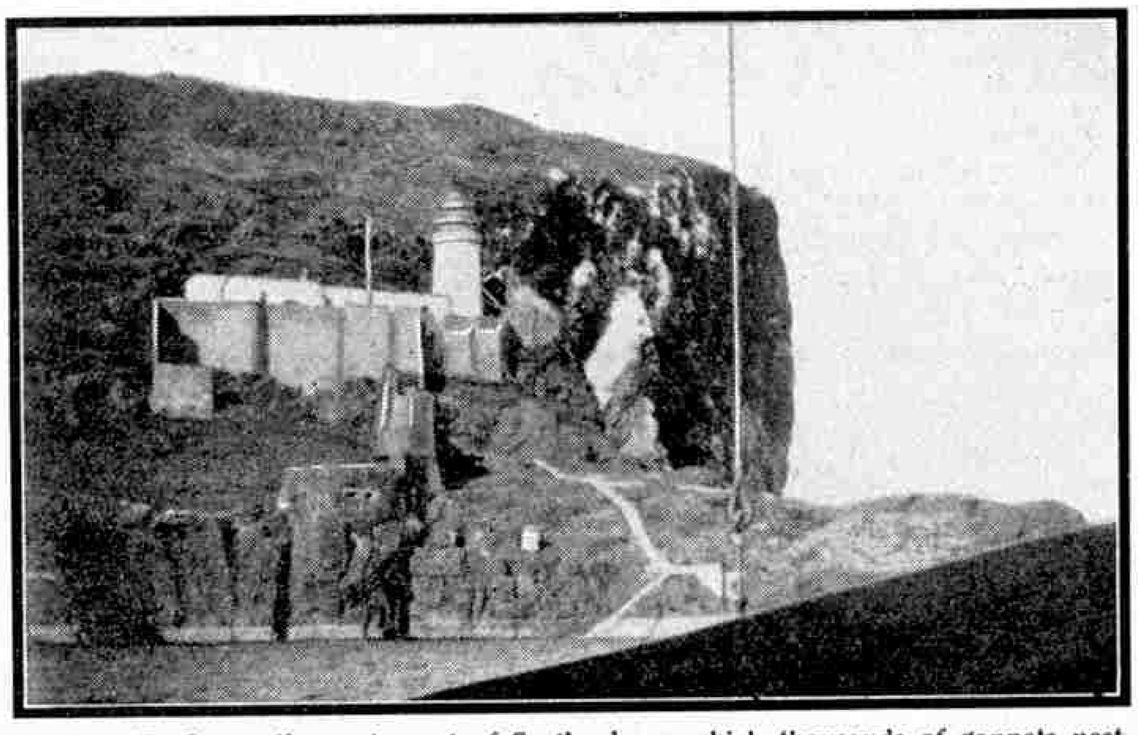
Perhaps someone might be planning a canoe trip into the interior, among the forests, mountains and waterfalls. Next day he sets off with his Indian guide, who acts as general navigator and also as cook. Clothed in the roughest of wear, including several sweaters and other woollen garments, they penetrate far into the depths of the forests, where French River and its countless tortuous tributaries flow. Along their shores they meet the beaver, the porcupine and the deer, all enjoying a freedom unknown to city dwellers, in which they themselves share for a few days.

The station at French River is built of logs, and on seeing it visitors realise at once that they are in the forest country.

E. G. SMITH (Toronto, Canada).

The Gannets of the Bass Rock

Last summer I paid a visit to the Bass Rock, a short distance from North Berwick, on the east coast of Scotland, which is famous for the multitude of birds to be found on it. Outstanding among these are the gannets, or solan geese, that nest on the ledges of the high cliffs, and the Bass Rock probably is the most important of the few gannet haunts in Britain. It is estimated that since 1913 the number of breeding gannets there has risen from 6,500 to 8,300. When I visited the haunt every conceivable space seemed to be occupied by the birds, each pair with one enormous chick, in various shades of plumage and down.



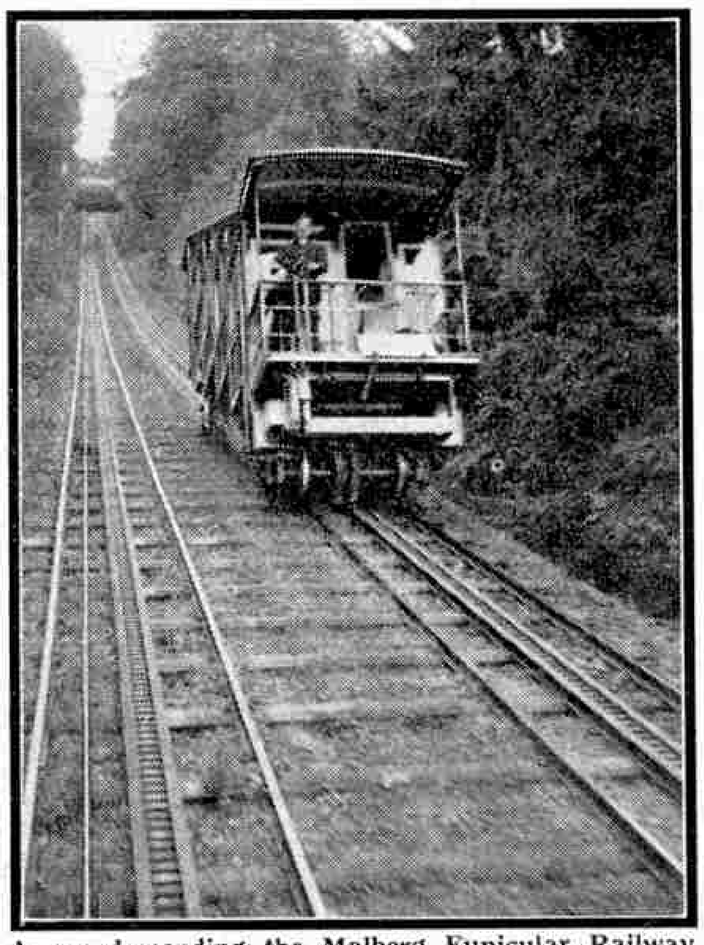
The Bass Rock, on the east coast of Scotland, on which thousands of gannets nest. Photograph by Rev. R. I. Mitchell, Lonmay, Aberdeenshire.

During the nesting season, many young gannets are "ringed," that is a ring is fastened on one leg. The ring contains instructions for its return if recovered on a bird, and during a recent five-year period 349 birds were marked in this manner. Some of the "recoveries" show to what great distances these birds sometimes fly and their wide dispersal. In 1927 one bird was found in Portugal, and another in Norway. In the following year a gannet from the Rock was found on the Faroes, and another appeared near Scarborough, Yorkshire, in 1929. Of the 1934 hatch, an outstanding recovery was made at Cape Blanco, on the West coast of Africa. Other Bass Rock gannets have reached Heligoland, in the North Sea, and Cape Finisterre, in France, while Bilbao in Spain and Casablanca in Morocco have both been visited by birds ringed on the Bass Rock.

REV. R. I. MITCHELL
(Lonmay, Aberdeenshire).

The Malberg Funicular Railway

While on holiday in Germany I visited Bad Ems, reputed to be the most beautiful town on the Lahn, which lies deep in a valley. The hills on each side rise to a height of more than 1,000 ft. above it, and from their summits there are magnificent views of the surrounding country. The most popular view is from the top of the Malberg, a mountain that can be ascended easily by means of a funicular railway that has been built on its slopes.



A car descending the Malberg Funicular Railway at Bad Ems, Germany. Photograph by D. J. Sutton,

This railway was opened in 1882. It climbs about 1,100 ft., and has a double track on which run two cars connected by a wire cable passing round a large wheel at the top. The cars are constructed in "steps," to accommodate them to the slope, and each can carry 44 passengers. The line is worked by gravity in a similar manner to that formerly employed in certain cliff railways in this country. Under each car is a tank, and the tank of the car standing at the top is filled with water. This makes it heavier than the second car, so that it descends, pulling up the other as it does so. On reaching the bottom the tank is emptied.

The speed of the cars is controlled by brakes of the band type, connected to a toothed wheel engaging with a rack between the rails. This type of brake gives a rather jerky motion, but one scarcely notices this when looking out of the window at the lovely scenery. The car at the lower terminus gives the signal to start by means of a wire connected to a bell at the upper level.

D. H. SUTTON (London, W.10).

The Calgary Stampede

This famous Canadian event is held once a year, and cowboys from all over the west of both the United States and Canada compete in the daily events for the cash prizes, and finally for the trophies.

The broncho-busting contest is always particularly interesting. Those entering it draw lots for choice of wild horses, and then endeavour to ride them for 10 seconds without touching mane or saddle with the free hand. This event is divided into two parts, in one of which saddles are not allowed.

Success in the calf roping event depends upon the skill of the cowboy with the lasso, and gives many good laughs to the spectators. A calf is turned loose and immediately starts to run like the wind towards the opposite end of the field. A roper gives chase and when he overtakes the calf he lassoes it, hooks the rope over his saddle horn with a half hitch, and leaps off. He then dashes to the calf and raises it in the air, before putting it down on its side and tying the rear legs and one front leg together. The tie is then inspected by the judges. A well-trained horse is invaluable in this attractive event.

Steer decorating is particularly thrilling and is surprisingly free from accidents. A steer is chased in at one end of the field and is pursued by two riders. One of these has two red ribbons with elastic bands attached, and has to drop off his horse on to the steer's head, and slip a ribbon over its horns. The decorator keeps his feet out in front of him, and pushes against the steer so that he will not be trampled upon.

The various events of last year's Stampede provided good sport and many thrills for the spectators, and among those who watched with great pleasure and enjoyment were Lord Tweedsmuir, the Governor-General, and Lady Tweedsmuir. His Excellency was particularly interested in the champion stock, and this delighted the stampeders so much that they presented him with a mounted buffalo head. A. H. ADLAM (Calgary).

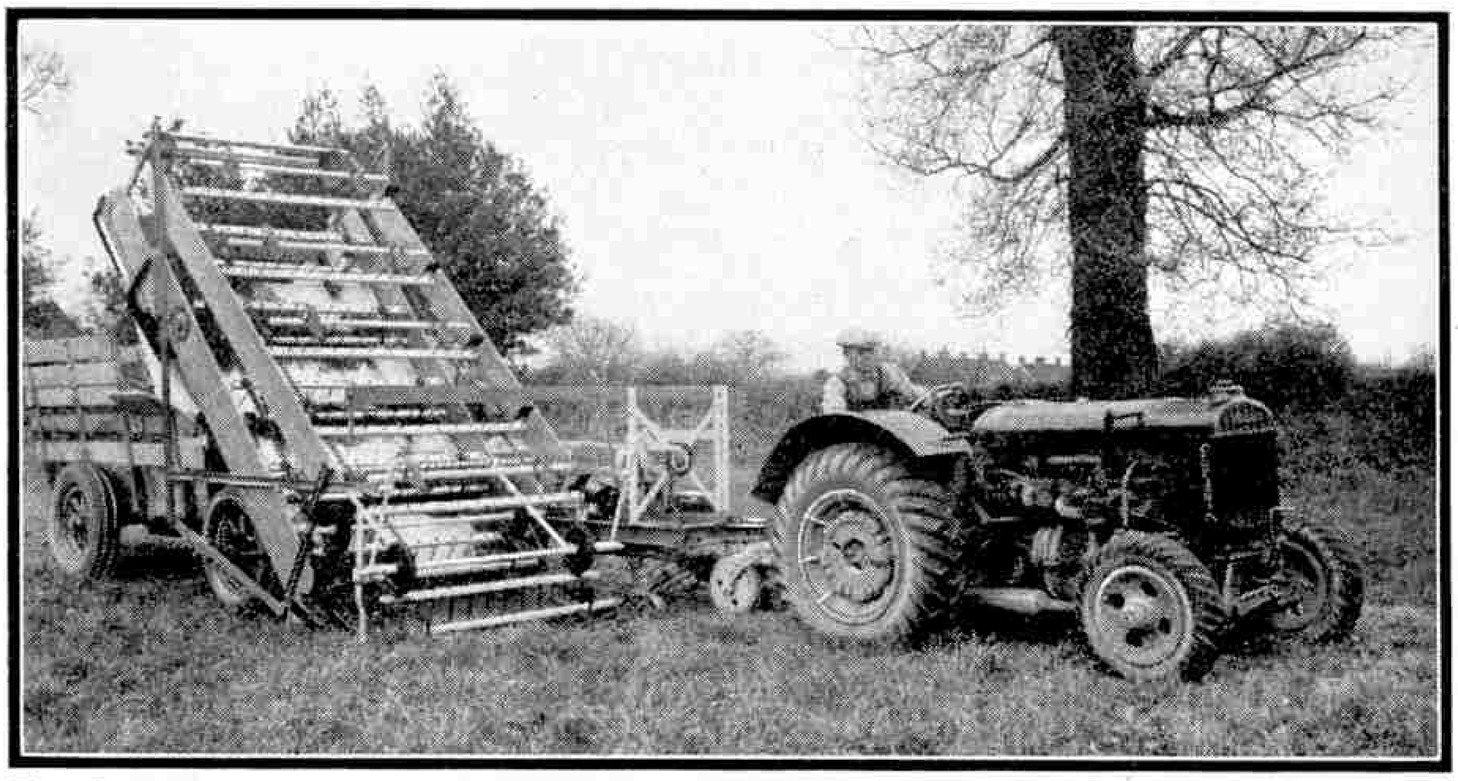
Engineering in Agriculture

New Machines for Work on the Land

IF a countryman of 100 years ago could visit a large modern farm, he would be amazed at the extraordinary extent to which machinery has been introduced. Ploughs, harrows and other implements are now often drawn by powerful tractors instead of horses, and improved cultivators hauled in the same manner have been introduced. Scythes have given way to the reaper and the self-binder, and this in turn is being displaced in many quarters by the harvester combine, which threshes the grain as it is cut.

These machines not only lessen the amount of manual labour required to run a large farm, but also effect a very great saving in time. New ones are constantly being introduced, or old ones improved by some addition, in order to speed up work still more.

Two machines that have recently been introduced are illustrated on this page and are concerned with widely different farm operations. The first, shown in our upper illustration, is designed for cutting grass and loading it into a wagon ready for drying. It is known as the "Cutlift" combined mower and elevator, and is manufactured by John Wilder Ltd., Reading. It consists of a cutting unit and an elevator, which are carried on a chassis fitted with two land wheels, and at the front is a swivel wheel for attachment to the draw-bar of the tractor by which the machine is hauled.



The "Cutlift" combined mowing and elevating machine, which is described on this page. The cut grass is carried up the inclined elevator and deposited in a trailer. Photograph by courtesy of John Wilder Ltd., Reading.

The mowing knife has a cut of 5 ft., and is carried in the frame of the elevator. It is driven by a Villiers two-stroke petrol engine through a clutch, and as the machine is hauled along, the grass is swept into contact with the knife by patented rakes. The cut grass is caught up by a series of rows of tines or spikes, which are attached to driven side chains and travel in the form of an endless belt over sprockets at each end of the elevator frame. When the grass reaches the upper end of the elevator it topples over and falls into a chute that leads to a trailer wagon.

The trailer is a low-loading vehicle, with a height from the ground of only 25 in. and a floor area of 9 ft. by 5 ft. 4 in. Its capacity is 2 tons, and it is mounted on two wheels fitted with pneumatic tyres.

The "Rapid" Trencher in operation. This machine can dig trenches from 8 in. to 15 in. in width and up to 5 ft. 6 in. in depth. Photograph by courtesy of R. H. Neal and Co. Ltd., London.

The machine shown in the lower illustration is of a different type from that just described. It is a trench digger, and while it is designed primarily for use in civil engineering work it is also suitable for use on farms and estates in connection with land drainage and pipe laying schemes. The machine, which is known as the "Rapid" Trencher, is a product of R. H. Neal and Co. Ltd., London, and it enables trenches for drains to be cut quickly, cleanly and cheaply with the minimum of labour.

Excavation is carried out by means of a line of steel buckets fitted with cutting edges. These are attached to a chain that travels around revolving supports at each end of a stout vertical boom, which projects downwards into the ground. The material dug out is deposited on a conveyor belt, arranged crossways in the machine, which discharges it at one side of the trench.

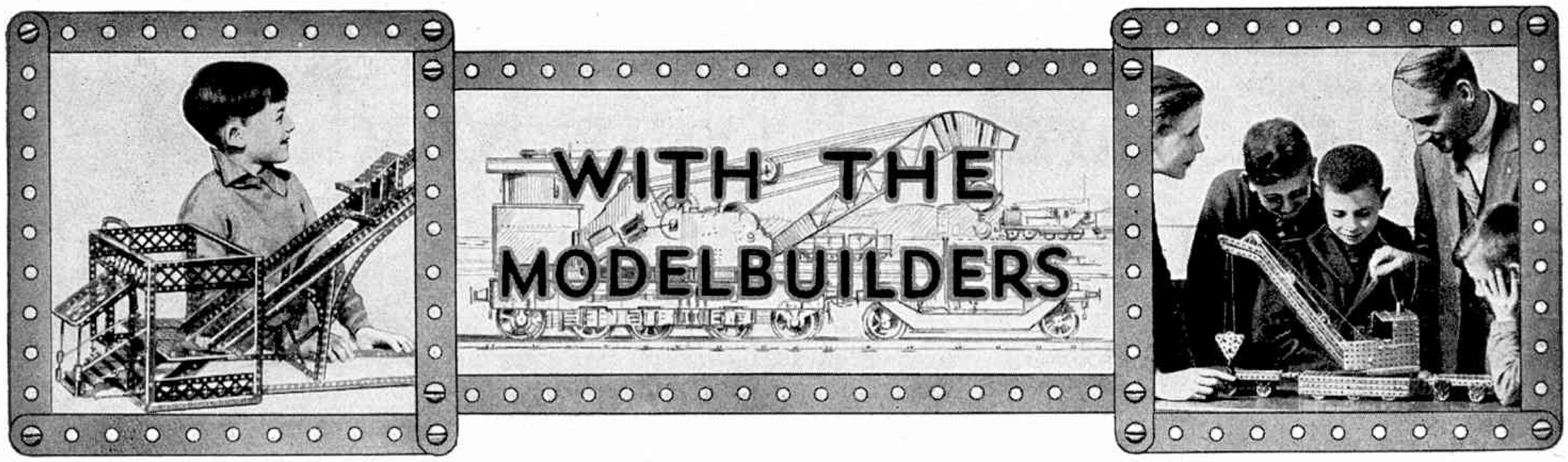
The average daily output of the machine when working in normal soil is about 800 to 1,000 lineal yards, and a field that would take several months to drain by hand can be dealt with in a few days by a "Rapid" Trencher. In soft ground the machine will cut a trench at the rate of 10 ft. per min., but for working in hard ground two slower cutting speeds of 4 and 2 ft. per min. are provided.

The machine is mounted on creeper tracks, and has an overall width of 6 ft. The standard equipment is designed to give trench cutting widths of 12 in., 13½ in. and 15 in., and equipment also can be supplied for cutting widths of 8 in., 9½ in. and 11 in. The standard digging depth is 4 ft., but a special long boom for digging to a depth of 5 ft. 6 in. is available when required.

The extension of the digging boom that carries the bucket chain into the ground can be controlled as desired, and when once adjusted to excavate a trench of the required depth it can be set in that position while the work proceeds. The machine is operated by either a petrol or heavy oil engine, as desired, and the control levers for the various movements are grouped about a side platform equipped with a seat for the driver.

A special safety device is incorporated in the drive to the chain, in order to prevent damage to the line of buckets and driving mechanism if underground obstacles such as a hidden pipe or an extra large boulder are encountered. The device automatically disengages the drive so that the machine comes to rest, and resets itself automatically when the obstacle has been removed. As the machine works forward the trench bottom is kept clear of fine soil by a self-cleaning and self-setting scraper plate, which is arranged behind the boom and scrapes the bottom of the trench.

When journeying to or from the working site the machine can travel at a maximum speed of two and a half miles per hour. It is steered by altering the speeds of the creeper tracks relative to each other, that is, in making a turn the inner track is driven more slowly than the outer track. The low speeds required for digging are obtained through a worm gear drive and for the higher speed needed when travelling on the road, this is disconnected and the engine drive is transmitted through a spur gear. The weight of the machine in complete working order is about 8 tons.



HOW TO USE THE NEW MECCANO PARTS

The parts that have recently been added to the Meccano range greatly increase the model-building possibilities of the system and each can be used in various ways.

A particularly useful new part is the Formed Slotted Strip (Part No. 215). This is 3 in. in length, and is provided with a hole of standard size at its centre and a slotted hole at each end. The Strip is curved to a radius of 1¾ in., and four of them bolted end to end form a circle with a diameter of about 3 in. This fits around a ring of 2½ in. small radius Curved Strips, thus forming a wide-faced wheel of the type required in building small models, such as tractors or steam engines. Formed Slotted Strips are useful also for constructing the stern end of a ship's deck or the mudguard of a motor car, or for any purpose for which it was formerly necessary to bend an ordinary Strip.

Another new part with a variety of uses is the Semi-Circular Plate (Part No. 214). This is perforated with holes of standard size, spaced ½ in. apart, and is particularly useful for filling in the ends of curved structures, such as the wing tip or rudder of an aeroplane. Two of the Plates overlapped along their straight edges form a circular plate, 2½ in. in diameter, which can be used for filling in the ends of cylindrical structures. Two Semi-Circular Plates bolted to a Wheel Flange or a 2 in. Pulley make a strong and effective driving wheel for a large model locomotive, the Semi-Circular Plates representing the wheel flange.

Two other interesting new parts are the Rod Connector (Part No. 213), and the Rod and Strip Connector (Part No. 212). The Rod Connector is a thin metal sleeve. It is intended for connecting two Rods, and is useful when Couplings are not available for this purpose. The Rod and Strip Connector is designed for joining a Strip to a Rod, and can be used as a crosshead in small model engines and in any position where a pivotal connection between a Rod and a Strip is required. Two Rod and Strip Connectors provide a neat pivotal connection between two Rods.

In the past a cylinder for a model engine could only be made by bending Plates or Strips except in cases where the Sleeve Piece (Part No. 163) was suitable. This necessity is avoided by the introduction of the Cylinder (Part No. 216). This is 2½ in. long and approximately 1¼ in. in diameter, and can be used with good effect in a variety of models. When desired it can be fitted with ends by using two other parts recently introduced. These are the 3 in. Screwed Rod (Part No. 80c) and the 1¼ in. Disc (Part No. 217a), a Screwed Rod being used to clamp two Discs in position at the ends of the Cylinder. The 1¼ in. Discs can also be used as wheels in small models of various kinds.

The ¾ in. Discs (Part No. 217b) are also suitable for use as wheels in miniature models, but innumerable other applications can be found for them. For instance, two ¾ in. Discs, spaced apart by Washers, form a novel and efficient crosshead for models in which an Eye Piece is too small for the purpose. These Discs can be used also to cap the ends of a Sleeve Piece.

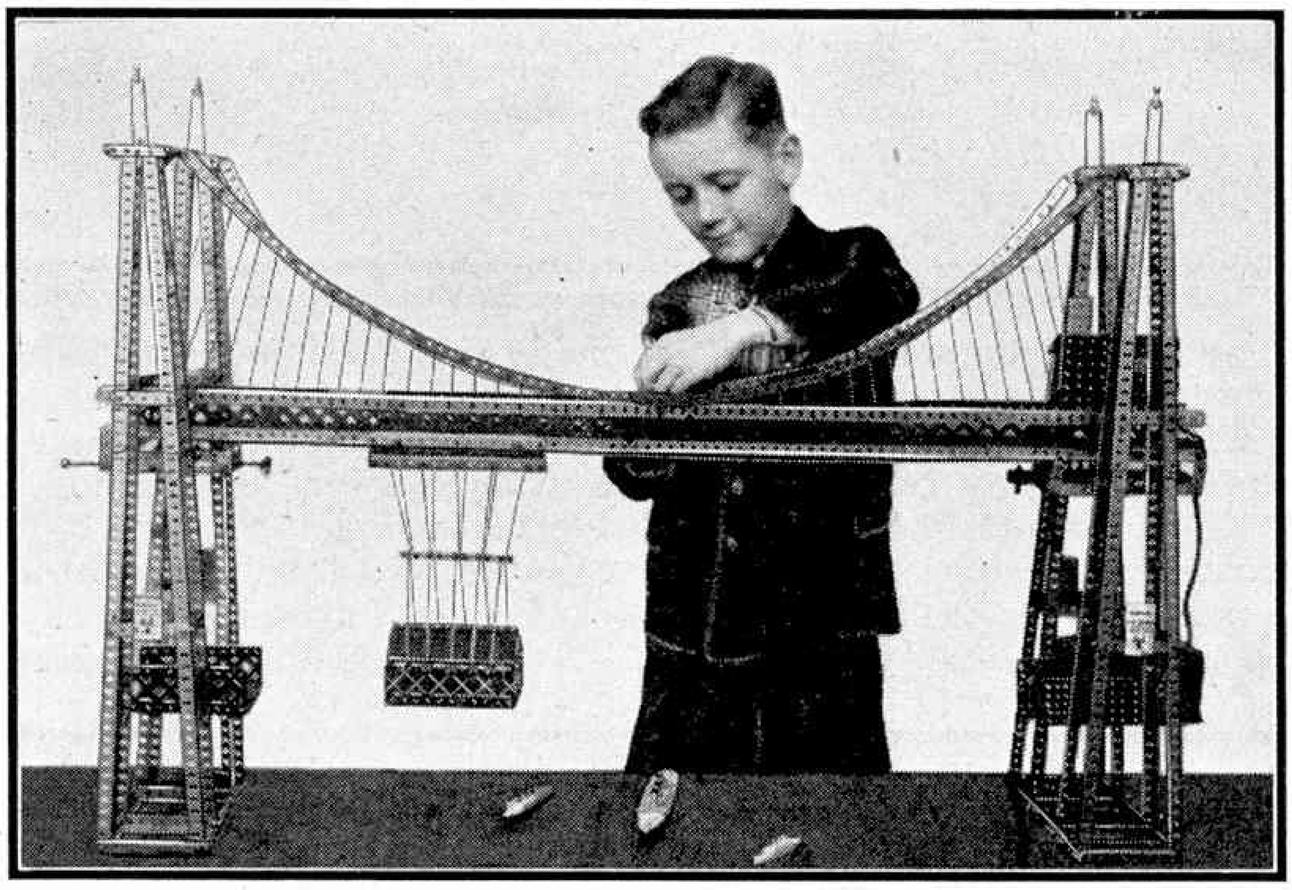
When 2 in. Pulleys fitted with Motor Tyres are used as the road wheels of a motor chassis, their appearance can be improved by fitting them with the new Wheel Discs (Part No. 219). The Wheel Discs are similar to the discs of a Meccano Road Wheel. They fit inside the rim of a 2 in. Pulley, and are held in place on the axles by Collars or Spring Clips.

The Rubber Ring (Part No. 155a) fits the rim of a 1 in. Pulley and forms an excellent tyre for a small model motor car or lorry. Several Rubber Rings are included in all the Outfits of the new series.

Two of the old Meccano parts are now available in an improved form. These are the 5 in. Crank Handle (Part No. 19h) and 3½ in. Crank Handle (Part No. 19g). They are now supplied fitted with a loose Erinoid sleeve on the handle, which makes them easier to turn.

A SIMPLE INTERNAL EXPANDING BRAKE

F. K. Jones, Aberystwyth, is a keen model-builder who has constructed a motor chassis that is rich in details of the usual type, such as differential, gear-box and Ackermann type steering. Its outstanding feature is an ingenious system of internal expanding brakes, however. These act on the rear wheels, which consist of 2 in. Pulleys fitted with Motor Tyres, and have Boiler Ends bolted to their inner faces. The rim of the Boiler End forms the surface on which the brake shoe acts. The rear axle is journalled at each end in the boss of a Bush Wheel, which is bolted to the centre of a Wheel Flange fixed to the chassis. The Wheel Flanges are so arranged that the Boiler Ends slip inside the Wheel Flanges when the rear wheels are fitted in position.



P. Hill, Hull, at work on a Meccano model transporter bridge. The model is mounted on a baseboard painted to represent water and a finishing touch is given by Dinky Toys Ships.

Each brake shoe is formed by a 5½ in. Strip, which is bent so it will just fit inside a Wheel Flange. It is then mounted by an Angle Bracket inside one of the Wheel Flanges that form the supports for the rear axle bearings. When a rear wheel is placed in position, the rim of the Boiler End bolted to it is gripped by the 5½ in. Strip and prevented from turning.

The brakes are controlled by a lever mounted in front of the driver's seat, the lower end of the lever being connected by Cords to the free ends of the Strips forming the brake shoes. The brake shoes are held clear of the brake drums when the lever is in its normal position, but when it is pushed forward the brake shoes expand and prevent the brake drums from turning.

A SWITCHBACK RAILWAY DISPLAY MODEL

For the purpose of a Meccano display at a recent exhibition, R. A. Truelove, London, W.14, constructed an interesting model switchback railway, which was operated by an Electric Motor. In this a small car is carried by a lift to the top of the switchback, and is then automatically released to run around the railway. When it reaches the end of the run it re-enters the lift, which carries it back to the top. Truelove informs us that the model worked continuously for long periods and always attracted a large crowd.

There is nothing unusual in the structural part of the model, but the mechanism used for starting the lift is worthy of description. The lift is provided with rails, and when the car runs on to these at the lower end of the switchback, it completes an electric circuit that supplies the Electric Motor that operates the lift. The Motor is not directly connected to the lift winding drum, but drives a heavy centrifugal governor, the movement of which operates a lever and brings a Rod into gear with the Motor shaft. The Rod is connected to the lift winding drum, which then revolves and hoists the lift carrying the car.

When the lift reaches the upper limit of its travel the rails strike a catch and tip endways. The car runs out into the top ramp of the switchback, thus breaking the electric circuit and switching off the current supply to the Motor. When the motion of the governor ceases, the winding drum is automatically disconnected from the Motor, and the lift falls back to its original position at the bottom of the shaft, ready to receive the car at the end of its journey.

MECCANO USED IN AMATEUR PHOTOGRAPHY

V. Riddick, Gateshead, a Meccano enthusiast who is also a keen amateur photographer, recently sent details of various pieces of photographic apparatus that he has built in Meccano and which he has found of great assistance in his dark room.

One of Riddick's devices is a novel guillotine machine for trimming prints. The machine consists of a 5½ in. × 2½ in. Flanged Plate, to one side of which a 5½ in. Strip is bolted, the two being spaced apart by a Washer on each bolt. The knife is formed by three safety razor blades, which are clamped end to end between two 5½ in. Strips. It is mounted on a 2 in. Rod by means of a Crank bolted to one end, and the Rod is journalled in a Coupling fastened to the end of the 5½ in. × 2½ in. Flanged Plate. The boss of the Crank is spaced from the coupling by a Collar and Washers. When the knife arm is allowed to fall, the cutting edges of the razor blades then pass between the side of the Flanged Plate and the 5½ in. Strip bolted to it. A Coupling is bolted vertically to the end of the knife arm to form a handle.

A NEAT PUSH-BUTTON SWITCH FOR ELECTRICAL MODELS

While building an electrically-operated model recently, M. Hayes, London, required a push-button switch to control an Electric Motor. As such a switch was not available he set to work and made one from Meccano, and in order to help other model-builders who may require a similar switch he has kindly supplied full details of its construction.

A Compression Spring is cut in two, and one half is placed on the shank of a Pivot Bolt, which is then slipped through the boss of a 1⅛ in. Flanged Wheel, and fastened in position by lock-nuts. The Flanged Wheel is bolted to a 2½ in. × 1½ in. Flanged Plate, through the centre hole of which an insulated 6 B.A. Bolt has previously been fastened. When the Pivot Bolt is pushed down, its lower end makes contact with the head of the 6 B.A. Bolt. One of the wires from the Transformer or battery in use is connected to the 6 B.A. Bolt, and the other to a terminal that is earthed to the Flanged Plate.

A more compact switch, of similar action to that already described, can be quickly and easily built up by mounting a Meccano Spring Buffer (Part No. 120a) in the centre hole of a Double Bent Strip. The Double Bent Strip is then bolted to a 1½ in. Strip, through the centre hole of which an Insulated 6 B.A. Bolt is fastened, the head of the Bolt being spaced from the Strip by three or four Washers placed on its shank. When the head of the Buffer is pressed downwards its lower end makes contact with the head of the Bolt. The leads from the Transformer or Accumulator are connected to the shank of the 6 B.A. Bolt and to the 1½ in. Strip.

A simple knife switch can be made by pivotally mounting a Strip on a Flanged Plate. The Strip is arranged so that when it is in a horizontal position, it lies between, and electrically connects, two Angle Brackets fastened at the other end of the Plate by insulated 6 B.A. Bolts.

In Search of New Models

Unusual Railway Subjects

RAILWAYS provide an endless variety of really good subjects for owners of Outfits of various sizes. For instance, thousands of splendid models of locomotives of all kinds have been built. There is ample scope for more, and interest in this popular corner of the Meccano model-building world is maintained by the appearance of new locomotive designs, such as the streamline engines of the L.M.S. and L.N.E.R. in this country, and of various railways in countries overseas. It is good fun to build miniatures of these, whether they are simple representations or elaborate models full of detail. In the present article, however, we wish to give some idea of what can be done to add interest and novelty by choosing unusual railways and engines. The "*M.M.*" is a splendid source of ideas in this respect, for many quaint and uncommon railways have been illustrated in its pages.

The different types of locomotives used for hauling trains up steep gradients in mountainous countries give model-builders excellent opportunities. On a very steep incline the weight of the engine alone is not sufficient to give the driving wheels the required adhesion to the rails, and consequently it has been necessary to design locomotives specially for work of this kind. In one well-known type the engines are provided with driven cog-wheels that engage a toothed rack laid between the ordinary running rails. The Snowdon Mountain Railway in North Wales is of this type.

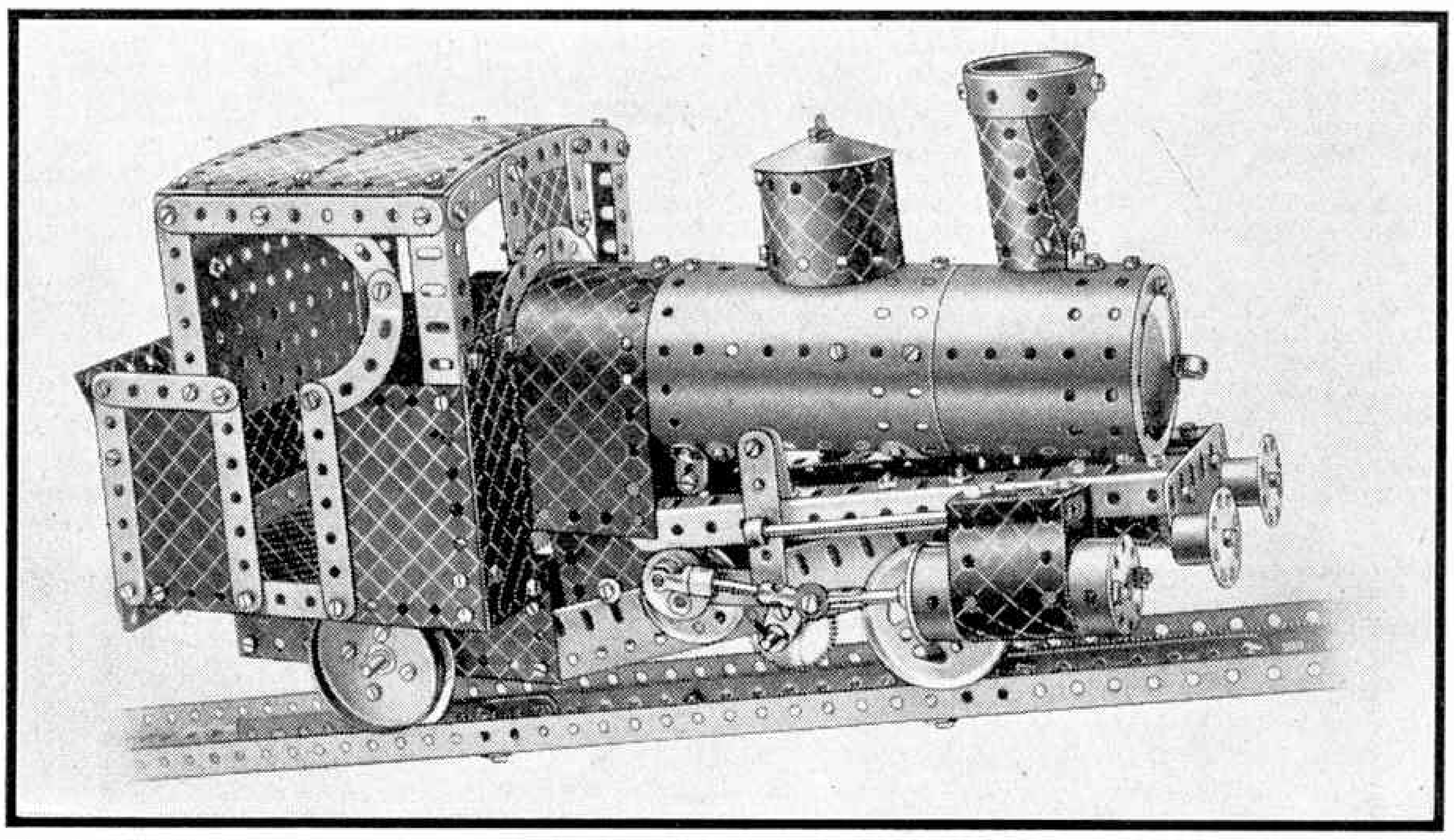


Fig. 1. A realistic reproduction of the rack locomotive used on the Vitznau-Rigi rack railway, Switzerland.

Some rack locomotives are driven by electricity and others by steam. A model of the latter type is shown in Fig. 1, which represents one of the engines used on the Vitznau-Rigi rack railway in Switzerland, an illustration of which appeared in the "*M.M.*" for June 1936. Its peculiar appearance is due to the fact that the boiler is mounted in a sloping position on the chassis, so that it is horizontal when the engine is climbing a steep incline.

In building a model rack locomotive it is quite easy to obtain the characteristic appearance of the actual engine, and the cog-wheel, which may be either a 50- or a 57-teeth Gear, can be driven by an Electric or Clockwork Motor housed in the cab. In the model shown in Fig. 1, the cog is made by two 50-teeth Gears butted together, and engages a rack made up of several Rack Strips bolted end to end to the sides of 12½" Strips.

In building a model of this type, the boiler can be made with Flexible Plates bolted around Circular Girders, or in smaller models around circles of the new Formed Slotted Strips. The main frame of the engine need be only a straightforward arrangement of Angle Girders or Strips. For the cylinders the new 2½" Cylinders are suitable, or Sleeve Pieces, fitted at each end with ¾" Flanged Wheels, can be used, but for large models Boilers will be found best.

It will be seen that the builder has no lack of resource, whatever the scale of his model.

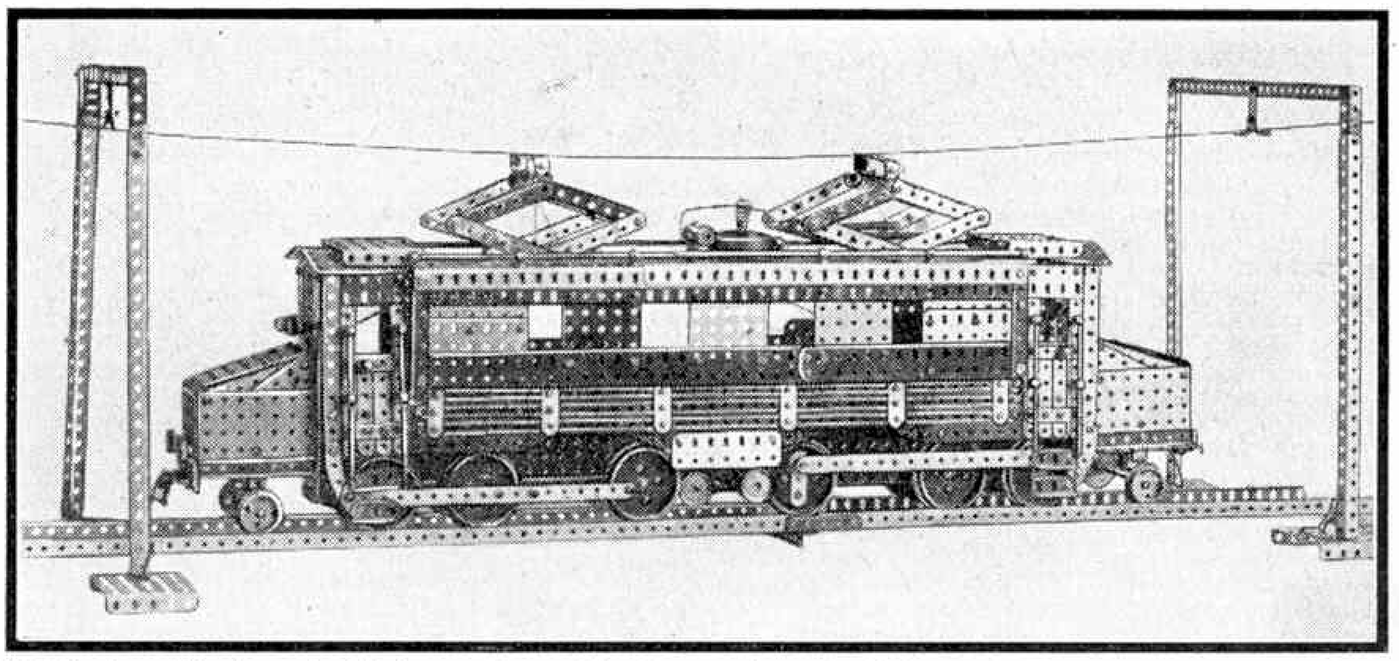


Fig. 2. A model of an electric locomotive, of the type used on the Swiss Federal Railways. It was built by E. Stonyer, New Zealand, and possesses many features that make it of interest to model-builders.

Model-builders who possess only small Outfits need not be discouraged from attempting models of this kind, for it is quite easy to make a simple but realistic model from a few parts. For example, a 2½" Cylinder can be used for the boiler, and a *Magic* Motor for the power unit. The rack may be replaced by a centre rail of Strips, and the cog by a ½" Pulley driven from the Motor.

In electric rack locomotives the current supply for the Motors is picked up from overhead conductors. The general appearance of engines of this type is similar to that of ordinary electric locomotives, except that the cab is built on the slope so that it assumes a horizontal position when on an incline. Model-builders who are

interested in electrical matters will find a model of this kind particularly interesting, owing to the scope for experiment with different kinds of pick-up systems and arrangements of the conductor wires or rails.

The funicular railway, which is often used in places where the gradient is too steep to permit the use of a locomotive, is another interesting mountain transport system that will give model-builders opportunities to display their skill. A typical model of this kind is shown in Fig. 3. The coaches are hauled up the incline by a power-driven cable that passes over driving pulleys at each terminal of the track. Underneath each coach is a special device by means of which the cable is gripped. Funicular railways are suitable only for short tracks with no curves.

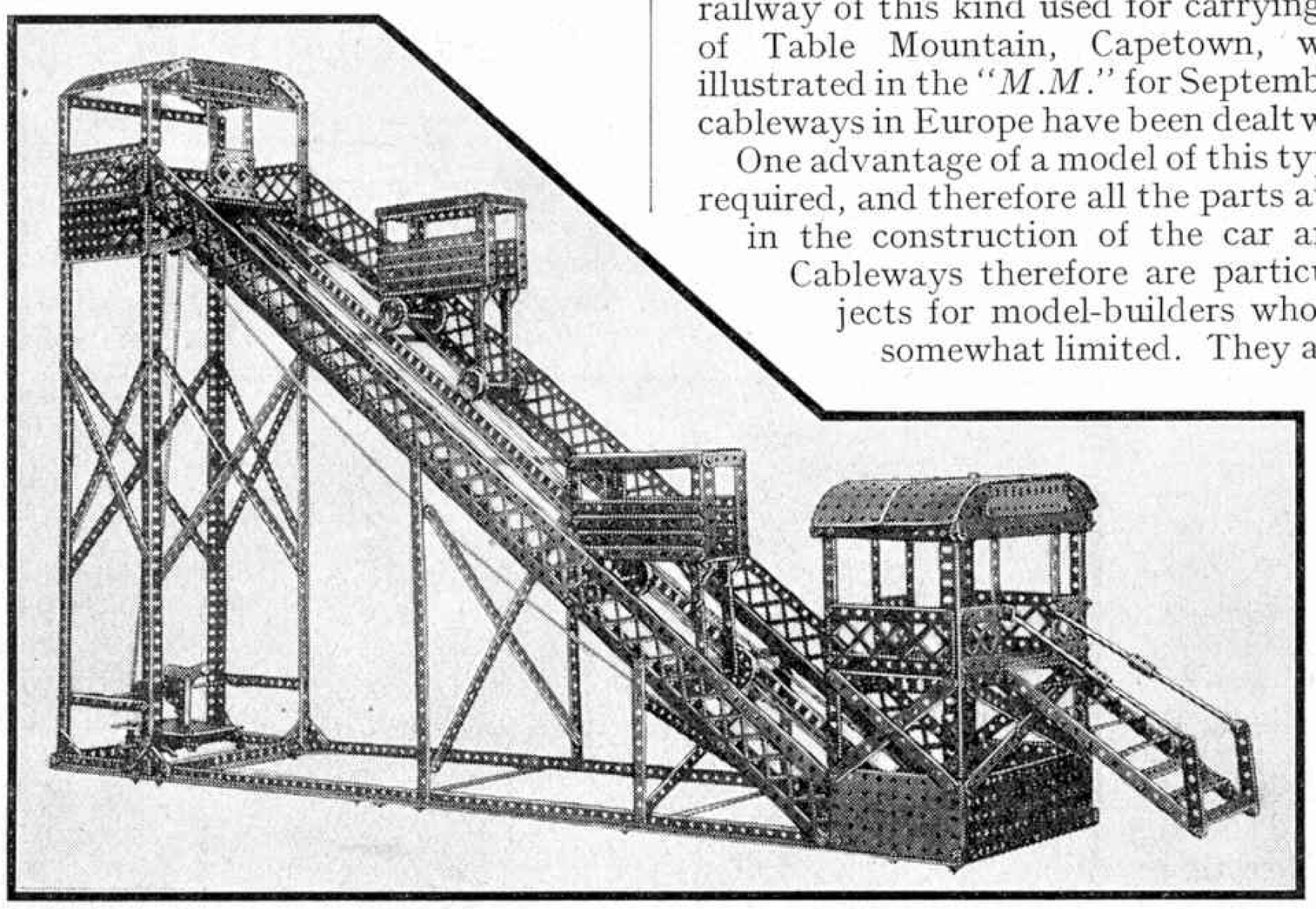


Fig. 3. Funicular railways are fascinating subjects for models. This example was built by J. Moses, Acomb, York, and is operated by a Clockwork Motor.

All the essential details of such a railway are included in the model illustrated in Fig. 3. This represents a funicular railway of the balanced type, which has two tracks and two coaches that operate simultaneously, one ascending while the other descends. The weight of the descending coach balances that of the ascending coach, and so the motor power required to operate the system is reduced.

An elaborate model of this kind requires a large number of parts for its construction, but owners of the smaller Outfits will find it good fun to build a more simple model using only one coach. In this case the power unit can be a Clockwork Motor, and providing that care is taken to reduce friction to a minimum, the *Magic* Motor can be used successfully. Whatever kind of power unit is used it is best to place it beneath the platform of the upper terminus. Sprocket Chain makes the best cable for hauling the carriages, but if this is not available Cord can be used satisfactorily, and it is good fun to haul cars up with Dinky Toys people in them, or with suitable loads of some kind.

Yet another method of transport used in mountain districts where the gradient is too steep to permit any of the previous methods being employed, or where it is difficult or impossible to lay a track, is the cableway. In this system passengers and goods are carried in a car suspended on wheels running on a steel cable fixed to anchorages at each end. The car is hauled to and fro by a second cable operated by powerful winding machinery. A railway of this kind used for carrying tourists to the top of Table Mountain, Capetown, was described and illustrated in the "*M.M.*" for September 1932, and similar cableways in Europe have been dealt with in other articles.

One advantage of a model of this type is that no track is required, and therefore all the parts available can be used in the construction of the car and the anchorages. Cableways therefore are particularly suitable subjects for model-builders whose stock of parts is somewhat limited. They also have the advantage that they are working models of a very attractive kind. Several models of this kind are shown in the new Instructions Manuals.

Other unusual railway subjects that provide ample opportunities for model-building are the various high-speed rail cars that have been evolved in recent years. One of the most interesting of these is the Bennie Railplane, a full description of which appeared in the "*M.M.*" for August 1930. The car consists of an elongated body fitted with an airscrew at each end, and it is suspended on wheels from an overhead rail supported by stout steel trestles. The model shown in Fig. 4 was built by P. Giese, Buenos Aires, and illustrates well the good work that can be done in this direction. The trestles and overhead rail structure are well reproduced by means of Angle Girders and Strips, and the car itself is a good example of the use of Flexible Plates for obtaining a streamline shape. The Plates are used with their plain sides outwards, and this gives a similar effect to that produced by the sheet metal of which the actual car is constructed. The airscrews at each end of the car are built up from Meccano Propeller Blades, and are driven by an Electric Motor housed in the car.

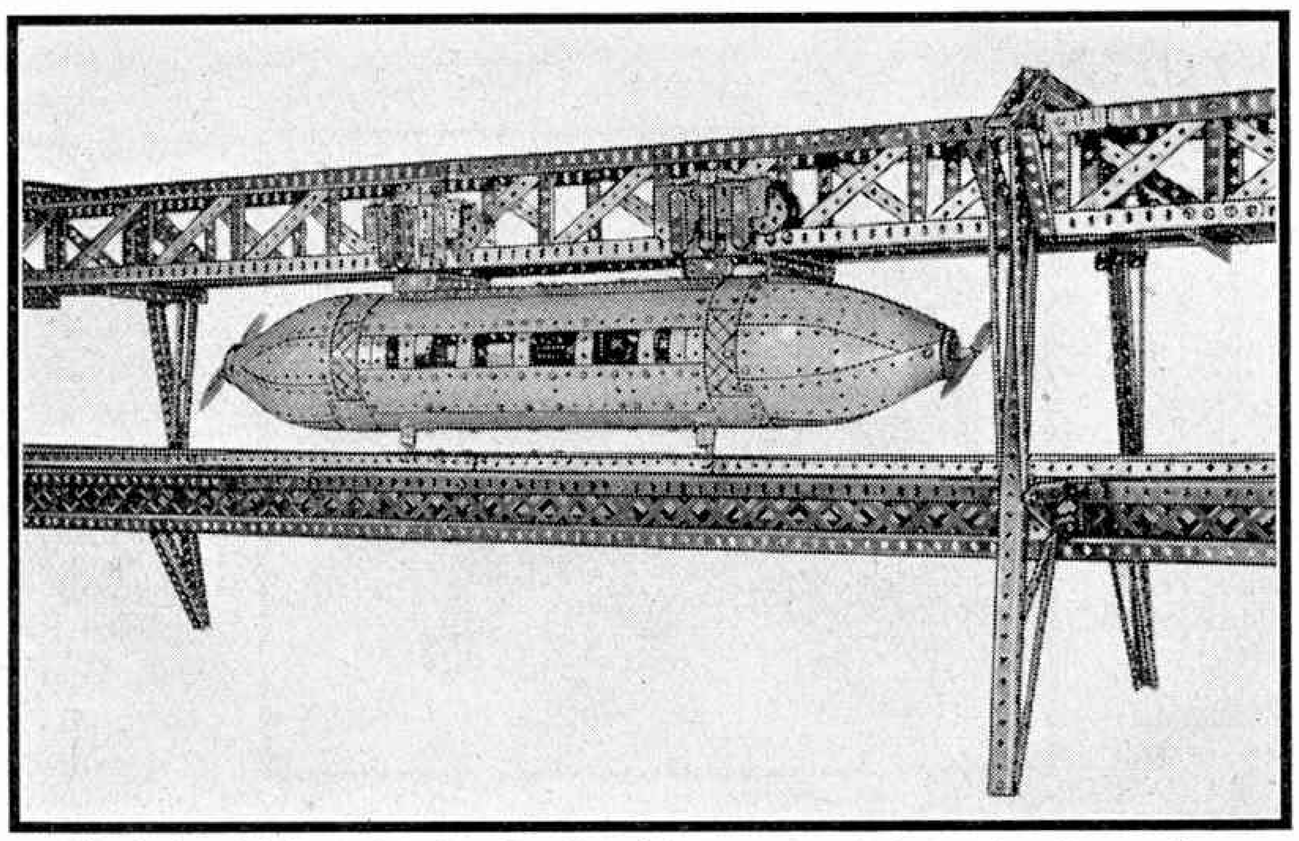


Fig. 4. A well-built model of the Bennie Railplane constructed by P. Giese, Buenos Aires.

The Bennie Railplane is not beyond the possibilities of a small Outfit, provided that the subject is tackled in a proper manner. The car itself can be made with a few Flexible Plates for the sides and pieces of cardboard for the pointed ends. Strips bolted to Bush Wheels will provide good airscrews, and these can be driven by a *Magic* Motor housed inside the car. The drive from the Motor should also be used to rotate the rail wheels.

New Outfit Models

Five Simple Subjects for Beginners

AT this time of the year thousands of newcomers join the great army of model-builders. This month therefore we are describing five easily-built models that have been designed specially for those with little experience, and all of them can be assembled from parts contained in the smaller Outfits from No. O to No. 4.

The first model to be dealt with is a tank locomotive, that can be built with Outfit No. 2, and is illustrated in Fig. 1. The frame of this engine consists of three $5\frac{1}{2}''$ Strips, joined together at their ends by Flat Trunnions. At its forward end the boiler is mounted. This is made of two U-section Curved Plates bolted together overlapping one hole, and at the front is filled in by a Bush Wheel, which is fixed in position by two Angle Brackets. The boiler is attached to the frame at its forward end by means of an Angle Bracket and a Flat Bracket. How this is done can be seen in the illustration.

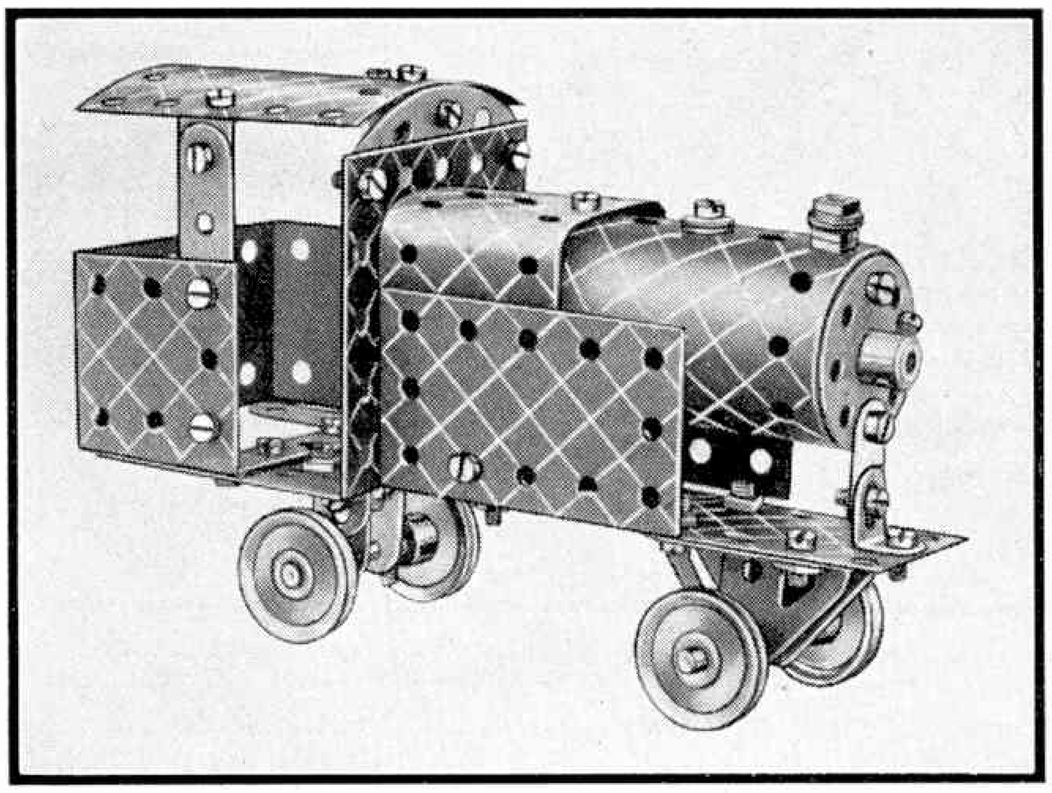


Fig. 1. A neat model shunting locomotive built with Outfit No. 2.

The boiler fire-box is made by curving a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate to the required shape and then bolting it over the rear end of the boiler. Each end of the Flexible Plate is secured to the frame by an Angle Bracket, and it provides additional support for the boiler. The chimney of the locomotive is represented by a $\frac{3}{8}''$ Bolt, which carries on its shank four nuts and a washer, and the water tanks consist of two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to the sides of the fire-box.

The cab can then be built. Its floor is constructed by fixing a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip across the rear of the frame, and to each end of this Strip, and at right angles to it, a $2\frac{1}{2}''$ Strip is bolted. The front of the cab consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate supported by an Angle Bracket. A $2\frac{1}{2}''$ small radius Curved Strip is fastened across the top of this Flexible Plate, and it is attached also to a $1\frac{11}{16}''$ radius Curved Plate by an Angle Bracket. The Curved Plate forms the roof of the cab, and it is supported by two $2\frac{1}{2}''$ Strips and two Angle Brackets from the ends of the Double Angle Strip. The sides and back of the cab are made with a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, the ends of which are bolted to the $2\frac{1}{2}''$ Strips that support the roof.

Four $1''$ Pulleys are used for the wheels, and the forward pair are fastened on a $2''$ Rod journalled in two Trunnions secured under the frame. The rear axle also is a $2''$ Rod, passing through holes in two Flat Brackets fastened by Angle Brackets to the chassis. The axles are prevented from sliding in their bearings by means of Spring Clips.

Parts required to build shunting locomotive: 3 of No. 2; 4 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 17; 4 of No. 22; 1 of No. 24; 4 of No. 35; 42 of No. 37a; 41 of No. 37b; 3 of No. 38; 2 of No. 48a; 1 of No. 90a; 1 of No. 111c; 2 of No. 126a; 2 of No. 188; 2 of No. 189; 1 of No. 190; 1 of No. 199; 2 of No. 200.

The deck chair, illustrated in Fig. 2 is simple, but effective and interesting. It is built with Outfit No. O, and consists of two frames, each of which is built up by joining the ends of two $5\frac{1}{2}''$ Strips with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The frames are pivoted together by a $3\frac{1}{2}''$ Rod, which is held in place by two Spring Clips.

The back of the chair is supported by two $2\frac{1}{2}''$ Strips. These are pivotally attached to the back of the chair by lock-nutted bolts, in the positions shown, and are joined at their lower ends by a further $2\frac{1}{2}''$ Strip and two Angle Brackets. In order to lock-nut the bolt, this is first pushed through the $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips and a nut is placed on its shank and screwed up sufficiently to hold the bolt in place. The first nut is then held with the spanner while a second nut is screwed tightly up against it. The shanks of the bolt that fix the $2\frac{1}{2}''$ Strips to the Angle Brackets, catch on two bolts that are fastened through the $5\frac{1}{2}''$ Strips that form the lower frame.

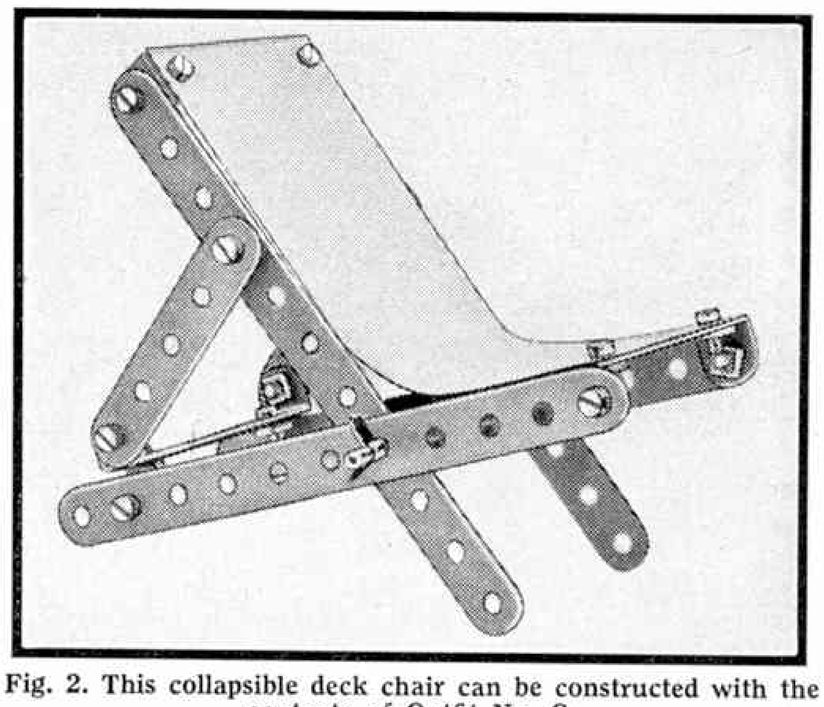


Fig. 2. This collapsible deck chair can be constructed with the contents of Outfit No. O.

The canvas of an actual deck chair is represented by a piece of thin cardboard, or other suitable material, measuring $5\frac{1}{2}'' \times 2\frac{1}{2}''$, which is bolted between the two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

Parts required to build model deck chair: 4 of No. 2; 3 of No. 5; 2 of No. 12; 1 of No. 16; 4 of No. 35; 20 of No. 37a; 16 of No. 37b; 2 of No. 48a.

The model racing car, shown in Fig. 3, can be built from the contents of Outfit No. 3. It is driven by a *Magic* Motor and runs at a good speed.

Construction is commenced by bolting two $2\frac{1}{2}''$ Strips together so that they overlap two holes. The compound strip so made is then curved, and its ends are fastened by two Angle Brackets to the flange of a Trunnion 1. This structure forms the frame of the radiator, and it is filled in by bolting a $1\frac{1}{4}''$ Disc to the Trunnion 1. The bonnet of the car consists of four $5\frac{1}{2}''$ and four $2\frac{1}{2}''$ Strips, which are fastened to the compound strip as shown in the illustration.

The *Magic* Motor is bolted in position, with its winding spindle pointing downwards, between the rear ends of the $5\frac{1}{2}''$ Strips, the Bolts by which it is fixed in position holding also a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The Flexible Plate forms the body of the car just behind the driver's cockpit, and is extended to the rear by a second similar Flexible Plate, which is arranged to overlap the first Flexible Plate one hole. The tail of the car is built up by bolting a Flat Trunnion 2 to each side of the body at the rear, the space between the Flat Trunnion being filled in with a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, which is curved to shape and fastened to the Flat Trunnions by two Angle Brackets.

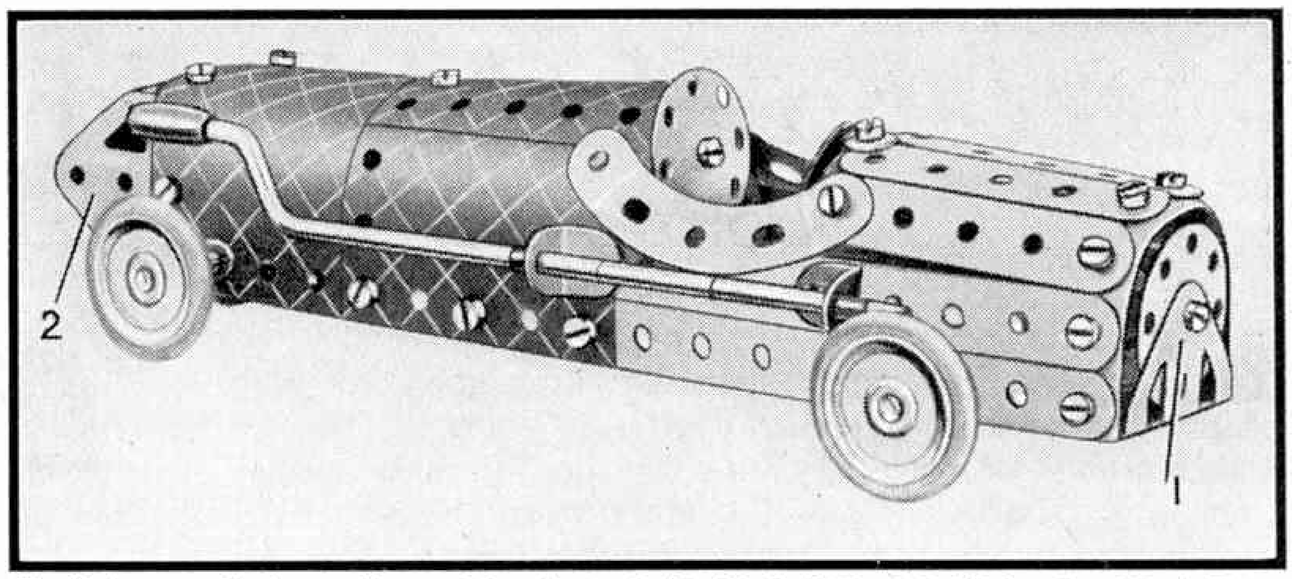


Fig. 3. An example of a working model racing car built with Outfit No. 3. It is driven by a Magic Motor.

In constructing the curved sides of the cockpit, two $2\frac{1}{2}''$ small radius Curved Strips are fastened to the ends of the $2\frac{1}{2}''$ Strip of the bonnet. The steering wheel, which is represented by a $\frac{3}{4}''$ Disc, is mounted by a lock-nutted bolt on an Angle Bracket. The latter is fastened to the centre of the front rim of the cockpit, and its arms are opened out slightly so that the steering wheel is inclined at a suitable angle. The driver's seat consists of a Trunnion, to the flange of which a $1\frac{1}{4}''$ Disc is bolted. The Disc forms the back of the seat, and is supported by an Angle Bracket from the back of the cockpit. The fairing behind the cockpit consists of a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate, curved to the required shape and bolted in position.

The axles of the road wheels are two $3\frac{1}{2}''$ Rods, each of which is journalled in the sides of the car and carries two $1''$ Pulleys fitted with Rubber Rings. They are prevented from sliding in their bearings by Spring Clips. The rear axle carries at its centre a $\frac{1}{2}''$ Pulley, which is connected by a Driving Band to the pulley of the *Magic* Motor.

A small Crank Handle represents the exhaust pipes, and to one end of it a $2''$ Rod is fastened by a Rod Connector. The exhaust is supported from the side of the car by two Angle Brackets, as shown in the illustration, and is fastened in position by two Spring Clips.

Parts required to build model racing car: 4 of No. 2; 6 of No. 5; 8 of No. 12; 2 of No. 16; 1 of No. 17; 1 of No. 19g; 4 of No. 22; 6 of No. 35; 35 of No. 37a; 34 of No. 37b; 5 of No. 38; 2 of No. 90a; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 1 of No. 188; 1 of No. 189; 2 of No. 191; 1 of No. 213; 2 of No. 217a; 1 of No. 217b.

A novel model that can be built with Outfit No. 1 is the horse and chariot illustrated in Fig. 4. The model is simple in construction and takes little time to build. It is best to begin by making the floor of the chariot. This consists of two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, a $2\frac{1}{2}''$ Strip and a $2\frac{1}{2}''$ small radius Curved Strip, all of which are fastened together by Flat Brackets. The front of the chariot is formed by a $1\frac{11}{16}''$ Curved Plate, fastened in position by an Angle Bracket, and the sides by two Flat Trunnions, which are bolted to the ends of the Double Angle Strip.

The bolts that hold the Flat Trunnions in position hold also two $5\frac{1}{2}''$ Strips. These form the shafts for the horse, and at their forward ends they are bent inwards slightly.

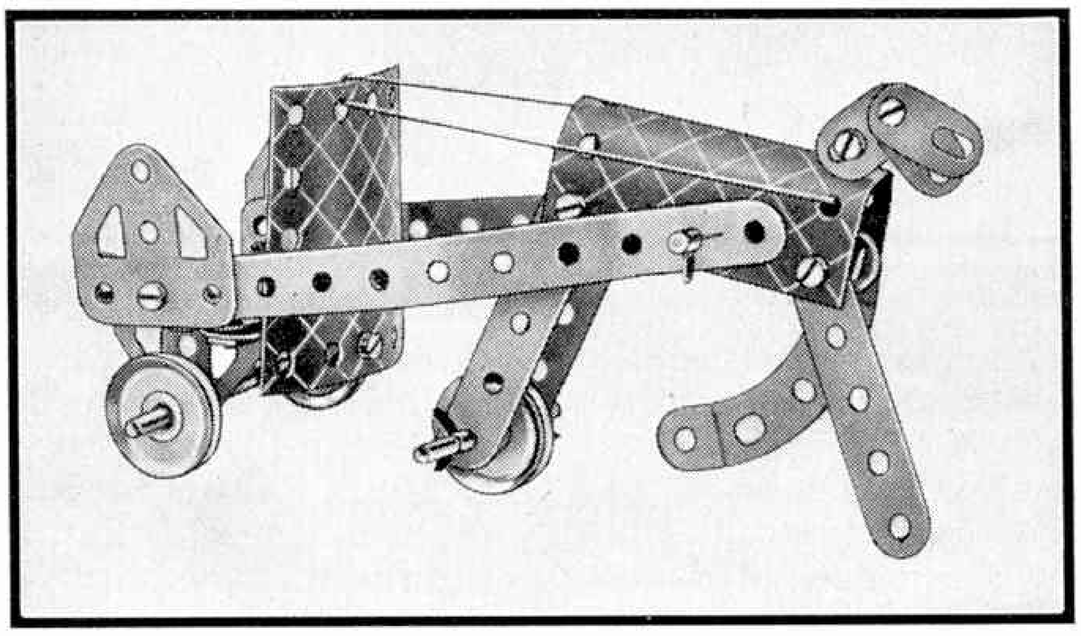


Fig. 4. This horse and chariot is easy to build and forms a novel subject for Outfit No. 1.

The wheels of the chariot, two $1''$ Pulleys, are fastened on a $3\frac{1}{2}''$ Rod, bearings for which are provided by holes in two Trunnions bolted underneath the two Double Angle Strips.

The body of the horse consists of a U-section Curved Plate, and to it three $2\frac{1}{2}''$ Strips and a small radius Curved Strip are bolted to represent the legs. For the animal's head Flat Brackets are used, and they are supported by means of a third Flat Bracket from an Angle Bracket bolted to the forward end of the U-section Curved Plate. The horse is supported between the shafts by a $2''$ Rod, which passes through the central holes in the sides of the Curved Plate and is secured in position by Spring Clips. The horse runs on a $1''$ Pulley mounted on a $2''$ Rod passed through holes in the $2\frac{1}{2}''$ Strips that represent the animal's hind legs. Its front legs are held clear of the ground by the reins.

Parts required to build model chariot: 2 of No. 2; 4 of No. 5; 3 of No. 10; 2 of No. 12; 1 of No. 16; 2 of No. 17; 3 of No. 22; 2 of No. 35; 18 of No. 37a; 18 of No. 37b; 2 of No. 48a; 2 of No. 90a; 2 of No. 126; 2 of No. 126a; 1 of No. 199; 1 of No. 200.

The frame of the model bicycle shown in Fig. 5 is built up from Strips of various sizes. The crossbar consists of two $2\frac{1}{2}''$ Strips joined by a Double Bracket, and to its forward end another pair of $2\frac{1}{2}''$ Strips are bolted. The last-mentioned Strips form the front down tube, and at their ends they are connected by means of a $2''$ Rod to two $3\frac{1}{2}''$ Strips. Two pairs of $2\frac{1}{2}''$ Strips connect the rear end of the crossbar also to the $3\frac{1}{2}''$ Strips.

The axle of the rear wheel is a $1\frac{1}{2}''$ Rod. It is pushed through holes in the ends of the $3\frac{1}{2}''$ Strips and carries the $3''$ Pulley representing the rear wheel and also a $\frac{1}{2}''$ Pulley. The latter Pulley is joined by a Driving Band to a $1''$ Pulley on the $2''$ Rod that connects the front down tube and the bottom bracket. Each of the pedals is made by bolting an Angle Bracket to a Reversed Angle Bracket, and they are held in place on the $2''$ Rod by Spring Clips.

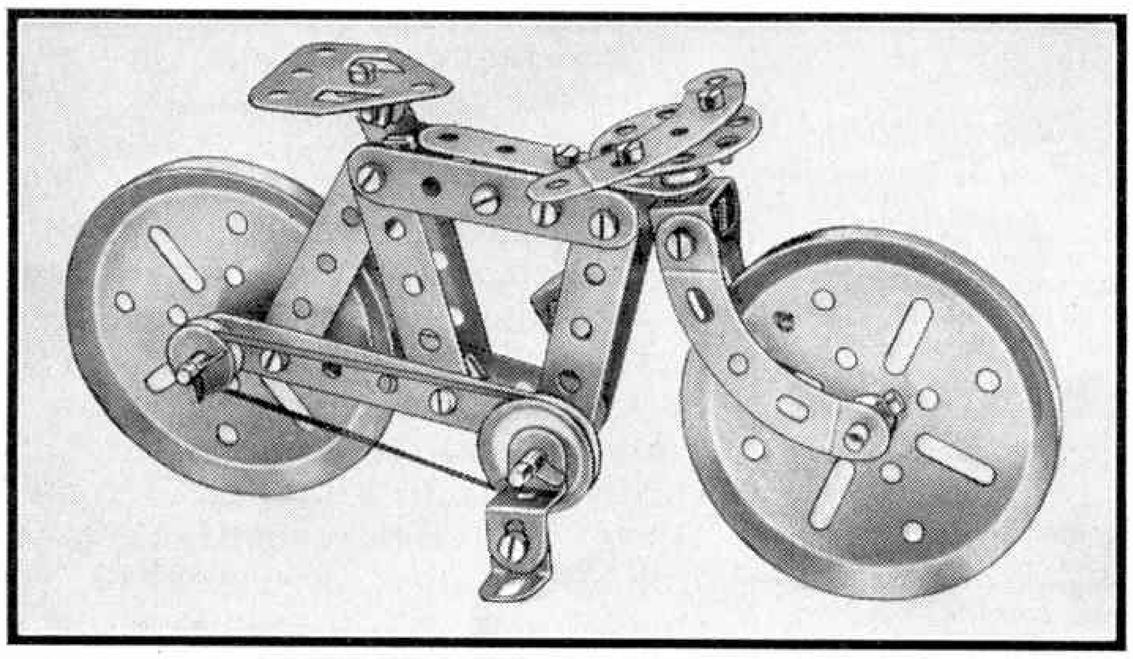


Fig. 5. A realistic pedal bicycle built with Outfit No. 4.

Parts required to build model pedal cycle: 9 of No. 5; 2 of No. 4; 1 of No. 10; 2 of No. 11; 4 of No. 12; 1 of No. 17; 2 of No. 18a; 2 of No. 19b; 1 of No. 22; 1 of No. 24; 2 of No. 35; 22 of No. 37a; 20 of No. 37b; 1 of No. 90a; 1 of No. 111c; 2 of No. 125; 1 of No. 126a.

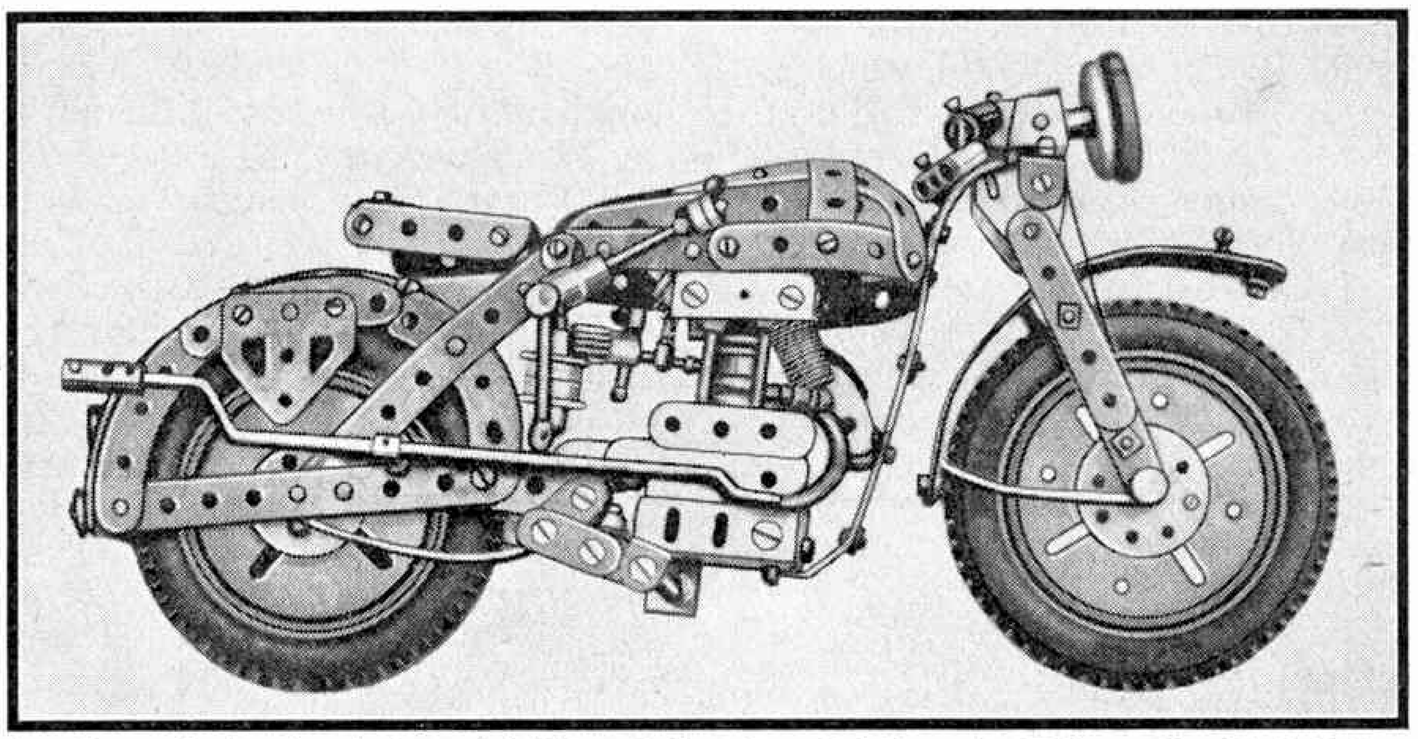
Meccano Model-Building Competitions

A Contest for all Meccano Constructors

This Contest has been specially organised to give Meccano boys of all ages, and with all sizes of Outfits, equal chances of winning one of the valuable prizes shown in the list in the panel at the foot of this page. All that a competitor has to do is to build a Meccano model based on his own ideas. Any number of parts may be used, and any type of model is suitable. There are no entrance forms to fill in and no fees to pay, and the only condition is that models must be the competitor's own unaided work, both in regard to design and construction.

In preparing their entries competitors should try to think of something original, and then set to work to make a neat model of it in Meccano. No matter how small or apparently insignificant this may be, it should be submitted in this Contest, because very often the smallest models prove the most interesting and carry off the largest prizes.

No competitor should think that he is not suited, or has not had sufficient experience, to compete in a model-building contest. The simple act of building Meccano models from an Instruction Manual affords all the experience that is necessary to put a competitor well on the road to success.



A good example of a prizewinning model. This realistic motor cycle is the work of B. Brown, Lowick, Kettering, and was among the successful entries in the "August" General Model-Building Competition.

It is not necessary to send the actual model. A photograph or a good drawing is all that is required. The sender's age, name and address must be written on the back of each photograph or drawing, and these should be forwarded to *"New Year Model-Building Contest,"* Meccano Ltd., Old Swan, Liverpool 13. A short description of the main features of the model, and details as to the size of Outfit from which it was built, should be sent with the illustrations.

There will be two sections: A, for readers of all ages living in the British Isles; B, for readers of all ages living Overseas. Entries for Section A must be posted in time to reach Liverpool before 28th February, 1938. Section B will remain open until 30th April, 1938. All prizewinners will be notified by letter.

"Meccano-Dinky Toys" Competition

In this competition readers are invited to submit Meccano models that incorporate suitable Dinky Toys. One example of the kind of model we have in mind is a dock scene, with quays and ships built from Meccano parts, and Dinky Toys Motor Vehicles and miniature figures placed at suitable points to add realism. Roundabouts of various kinds equipped with Dinky Toys Racing Cars, Aeroplanes or Horses, and aerodromes with Dinky Toys Aeroplanes also are suitable. Any quantity of Meccano parts or kind of Dinky Toys may be used as desired.

It should be clearly understood that the inclusion of Dinky Toys is essential. Models made entirely from Meccano are not eligible. Entries that can be set to work in some manner, however simple their movement, will have the greatest chance of success, and these may be driven by any form of Meccano power unit, such as an Electric or Clockwork Motor. Small models receive as much consideration as the largest structures submitted.

Actual models must not be sent. It is only necessary to submit either clear photographs, or if this is not possible, good drawings of models. Neither photographs nor drawings need be the competitor's own handiwork, but the model itself must be his own unaided work.

Readers living in any part of the world are eligible to take part in the competition, and all entries will be grouped into one Section. The age of each competitor will be taken into consideration when the models are judged. The prizes to be awarded for the best models received are listed in the panel at the foot of this page.

The competitor's name, address, and age must be written clearly on the back of each photograph or drawing sent in, and envelopes containing entries should be addressed *"Meccano-Dinky Toys Competition,"* Meccano Ltd., Binns Road, Liverpool 13. The competition will remain open until 30th April, 1938.

THE PRIZES

"New Year" General Model-Building Competition

The following set of prizes will be awarded in each section:

1st Prize, Meccano or Hornby products value £3/3/–.
2nd Prize, Meccano or Hornby products value £2/2/–.
3rd Prize, Meccano or Hornby products value £1/1/–.
5 Prizes of Meccano or Hornby products value 10/6.
5 Prizes of Meccano or Hornby products value 5/–.

"Meccano-Dinky Toys" Competition

The prizes are as follows:

1st Prize, Meccano or Hornby products value £3/3/–.
2nd Prize, Meccano or Hornby products value £2/2/–.
3rd Prize, Meccano or Hornby products value £1/1/–.
5 Prizes of Meccano or Hornby products value 10/6.
5 Prizes of Meccano or Hornby products value 5/–.

Model-Building Competition Results

By "Spanner"

August "General" Competition (Home Section)

A pleasing feature of the entries in this Competition was the originality shown by many of the chief prize-winners in their choice of subjects. Many of the models submitted were quite off the beaten track, and a few of the more outstanding of these are described on this page. The full list of prize-winners in the Home Section of the Competition is as follows:

1st Prize, Meccano or Hornby products value £3/3/–: B. Adair, Maryport. 2nd, products value £2/2/–: C. Williams, Manchester. 3rd, products value £1/1/–: E. Clements, Orpington.

Products value 10/6: D. Large, Wembley; W. Halsall, Burscough; B. Brown, Lowick, Kettering; F. Frost, Dagenham; N. Hughes, Liverpool.

Products value 5/–: M. Bryant, Birstall; C. Atkin, West Kirby; F. Thomson, London, S.E.1; K. Blanchard, Liverpool; H. Howard, Bedford; J. Brown, Fairlight; R. Thorpe, Preston; P. Lea, Shifnal; A. Daniel, Lingfield; R. Cyples, Buglawton.

A model of a magnetic concentrator machine was successful in winning First Prize for B. Adair, Maryport. The purpose of this machine is to separate the iron ore known as magnetite from the earthy matter or gangue with which it is mixed when mined. In it there are two conveyor belts, one above the other and at right angles to it, with powerful magnets above both. The mixture is passed through the machine on the lower belt. The iron ore in it is lifted by the magnets, and held against the lower surface of the upper belt, which carries it towards one side of the machine. When the iron passes beyond the influence of the magnets it falls from the belt and drops down a chute into a storage bin.

Adair has shown great skill in reproducing these interesting movements. In his model the two conveyors are made from strips of strong cloth, and are driven by a single Electric Motor, the drive to each being transmitted through a neat gear-box. The Motor is used to operate also a vibrating chute down which the ore is fed.

C. Williams won Second Prize with a model of R.M.S. *"King Orry,"* one of the passenger steamers of the Isle of Man Steam Packet Company. Williams sent an illustration of the actual ship with the photograph of his model, and comparison of the two reveals the accuracy with which details have been reproduced. The model is mounted on four wheels, two at the bow and two at the stern, and these are driven by an Electric Motor. Each of the forward wheels is built up in the form of a cam from a Bush Wheel and a Wheel Flange bolted together eccentrically, and they give the ship a realistic rolling motion as it moves along.

E. Clements, Orpington, Kent, chose the unusual but rather gruesome subject of a dentist's chair. He must have made a very careful study of this, for the model, which is illustrated on this page, is a very accurate and detailed piece of work. It has a swivelling seat, which is mounted on a circular pillar and can be raised, lowered or tilted into the required position. Adjustable head, back and arm rests also are provided, and these are moved by means of handwheels placed at the back of the chair.

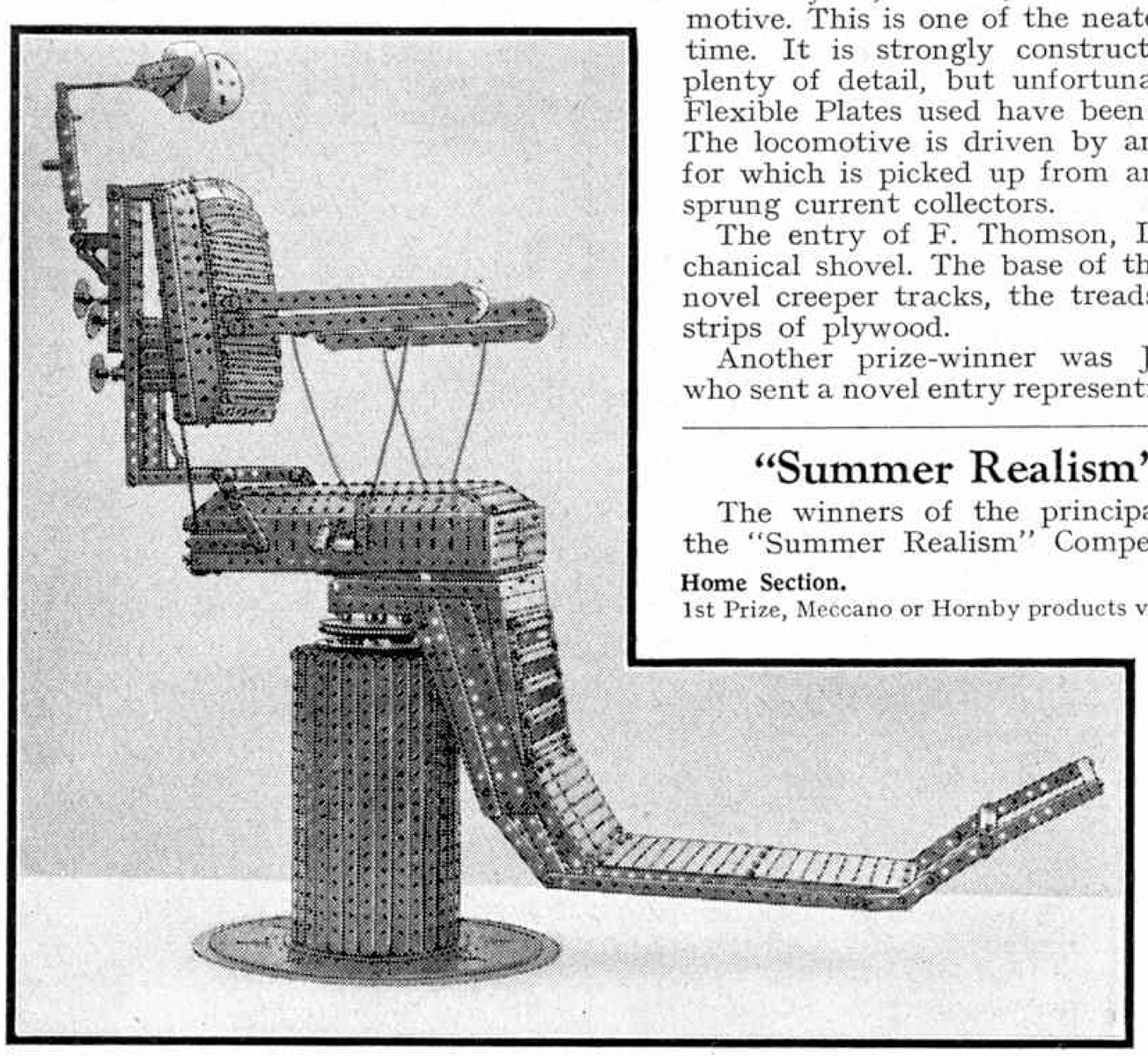
One of the youngest competitors to win a prize was B. Brown, Kettering, who is only 12 years of age. Brown built the remarkably neat model of a motor cycle illustrated on the facing page, and showed great skill in selecting suitable Meccano parts for representing the chief features of the engine. The magneto is a Socket Coupling fitted at each end with a Collar. The cylinder unit consists of four 1" Pulleys mounted on a short Rod, and is provided with two Screwed Rods to represent the valve push rods. A remarkably neat headlamp is made with a 1" loose Pulley, a Motor Tyre and a 1" loose Pulley fitted with a Rubber Ring, all of which are fastened on a Pivot Bolt.

At a recent printer's exhibition F. Frost, Dagenham, saw a large newspaper printing press. Then he went home and set to work to build a model of the machine in Meccano. It is this model that formed his entry in this competition, and although it is not complete in every detail, it is a very creditable piece of work in view of the fact that in building it Frost had to work entirely from memory.

M. Bryant, Birstall, sent a model of an L.M.S. tank locomotive. This is one of the neatest that I have seen for some time. It is strongly constructed throughout and includes plenty of detail, but unfortunately some of the Strips and Flexible Plates used have been bent or otherwise mutilated. The locomotive is driven by an Electric Motor, the current for which is picked up from an insulated third rail by two sprung current collectors.

The entry of F. Thomson, London, is a model of a mechanical shovel. The base of the machine is fitted with two novel creeper tracks, the treads of which are built up with strips of plywood.

Another prize-winner was J. Brown, Fairlight, Sussex, who sent a novel entry representing a daffodil growing in a pot.



Novelty is always a valuable feature in a competition model and was chiefly responsible for securing Third Prize in the "August" General Competition for this realistic model dentist's chair. The model was built by E. Clements, Orpington.

"Summer Realism" Contest Results

The winners of the principal prizes in each Section of the "Summer Realism" Competition are as follows:

Home Section.

1st Prize, Meccano or Hornby products value £2/2/–: C. Brown, Bradford. 2nd, products value £1/1/–: J. Reid, Eskbank, Midlothian. 3rd, products value 10/6: P. Frost, West Bridgford, Nottingham.

Overseas Section.

1st Prize, Meccano or Hornby products value £2/2/–: R. Dickison, Roslyn, Dunedin, N. Zealand. 2nd, products value £1/1/–: L. Capelli, Buenos Aires. 3rd, products value 10/6: R. Myburgh, Claremont, Cape Province, South Africa.

Second "Lynx Eye" Contest

The Instructions Manual illustrations from which the 16 fragmentary pictures in this Contest were taken are as follows: No. 1—(Outfit C) Pulley Block; No. 2—(Outfit D) Roundabout; No. 3—(Outfit F) Twin Cylinder Vertical Steam Engine; No. 4—(Outfit H) Spooling Machine; No. 5—(Outfit F) Flax Cleaner; No. 6—(Outfit G) Coal Tipper; No. 7—(Outfit D) Towel Horse; No. 8—(Outfit H) Pithead Gear; No. 9—(Outfit C) Swivelling Crane; No. 10—(Outfit D) Treadle Lathe; No. 11—(Outfit A) Liner; No. 12—(Outfit H) Armoured Motor Tricycle; No. 13—(Outfit F) Steam Wagon; No. 14—(Outfit B) Tramcar; No. 15—(Outfit H) Fret Saw; No. 16—(Outfit D) Mat Frame.

The following were the prize-winners in this Contest:

Home Section.

1st Prize, Meccano or Hornby Train products value £2/2/–: V. Bell, Blantyre. 2nd, products value £1/1/–: J. Stewart Choate, Abbey Hulton. 3rd, products value 10/6: F. Hemsley, Dunbar.

Products value 5/–: G. Johnston, Southall; R. Hughes, Llanbedrgoch; C. Wrayford, Bovey Tracey; Miss L. Slater, Portsmouth; A. Tipper, Exeter.

Overseas Section.

1st Prize, Meccano or Hornby Train products value £2/2/–: J. Jasper, Manly, Queensland. 2nd, products value £1/1/–: A. Dionne, Montreal. 3rd, products value 10/6: Miss J. McKenzie, Featherston, New Zealand.

Products value 5/–: D. Murison, Buenos Aires; J. Rowston, Orange; R. Dumont, Vaudreuil Station, Quebec; J. Demanuele, Malta; N. Rey, Mauritius.

New Year Greetings

This month I have the pleasure of wishing "A Very Happy New Year" to all members of the Meccano Guild. It is very encouraging to exchange these greetings with the thousands of members of this wide-spread organisation. There are few who receive these familiar, but always welcome good wishes from so many different countries as I do. I acknowledge every letter and card personally, but wish to take this opportunity of expressing my appreciation of the friendliness that has inspired so many members to write to me at this time of the year.

A Welcome to New Members

One of the most interesting features of the New Year is the great influx of new members of the Guild. I and my staff will be kept busy for the next two or three months enrolling boys who have made their first acquaintance with Meccano during the past week, or have had their interest in the great hobby increased by the enlargement of their Outfits. I wish to extend a hearty welcome to all who are now joining the Guild, and to assure those who have not yet sent in their forms that they also will be gladly received when they decide to join this famous brotherhood of Meccano enthusiasts.

The fun of being a Meccano boy is not complete unless it is combined with membership of the Guild and, if possible, of a Meccano club. Any new member who does not know the whereabouts of the nearest club should let me know, so that I can give him the necessary details. If there is no suitable club he should think over the possibility of forming one among his friends, and in that case I should be very glad to give him as much information and support as possible.

New members who cannot join or form clubs can always rely upon myself and the expert staff of model-builders and Hornby Railway experts at Headquarters. We are always ready with assistance and advice on model-building and other problems, and this is as freely and faithfully given by letter as if it came directly from the Leader of a club. Friendship with the Secretary is the keynote of Guild membership, and no member should hesitate to write as often as he wishes about his hobby, his ambitions in life, or anything in which he is interested.

While extending a welcome to new members, I do not wish to overlook old friends. I hope that with the New Year their Guild enthusiasm will be renewed, and that they will resolve to write to me regularly during the coming year. They can help in another way that will be in the true spirit of the Guild. Most of them will have some youthful acquaintance who is a recruit in Meccanoland, or at any rate would have very little difficulty in discovering one. They should make a point of helping these boys to become Guild members, and of doing something to enable them to realise to the full the fun of model-building in general. Such little friendly acts often have far-reaching results, and to-day there are many flourishing clubs that made a very modest beginning a few years ago with two or three members brought together in this manner.

Merit Medallions Awarded in 1937

BRIDGEND (Bryntirion School)—L. Hallam, P. Parry, D. Williams. CHELMSFORD (Great Baddow)—R. F. W. Guard, W. Manning. CHESTERFIELD (Mary Swanwick School)—K. Barfoot, J. Harle, M. Holmes, K. Leatherday. EDINBURGH (St. Giles Cathedral)—D. F. Forbes, A. N. Nicholson, W. Skinner, R. Turnbull. ("Twenty Eight")—J. B. Donald, J. R. Hay. EXETER—J. Bulley, J. Fenwick, C. Garrett, A. I. Hancock. FOLKESTONE—B. Cotter, R. Price. HORNSEA—N. Bird, A. Dowson, P. Richardson, R. Shepherd. JERSEY (The Beeches)—J. A. Gardner, W. Hobbs, A. M. Shepherd, D. Tredant. LONDON (Islington)—S. Gardiner. (Old Charlton)—F. Ambrose, W. Bailey. MAIDSTONE (Sutton Valence)—D. Newport. SIDMOUTH (Sid Vale)—H. Woodford. THORNTON HEATH (St. Oswalds)—R. H. Smart.

OVERSEAS CLUB MEMBERS

AUSTRALIA (Maylands, Perth)—A. Edwards, R. Harris, R. Le Cheminant, F. Nicholson, G. Petersen, W. Petersen, M. Thomson, L. Tutty. (Melbourne)—B. O'Neill. EGYPT (Cairo)—Y. Ibraheen, A. M. Hassaneen. (Zagazig)—A. M. Mangourie. FRANCE (Nommay)—Y. Humbert. HOLLAND (Maastricht)—A. A. H. Gilissen. ITALY (Milan)—E. Vigo. NEW ZEALAND (Ashburton)—W. McMullan, Miss M. Rogers. (Christchurch)—P. Chapman, R. A. Handisides, N. Mitchel. SOUTH AFRICA (Malvern)—R. Cowling, Miss M. Saunders. (Pioneer)—A. Easthorpe.

Choosing New Hobbies

I always encourage Leaders and officials generally to introduce new hobbies in order to give variety and to brighten up meetings. New pursuits should not be adopted indiscriminately, however. Instead some hobby or interest should be taken up that is likely to have a practical bearing on the chief aims of the club. For instance, in many clubs woodwork sections have been formed, and members have become skilful enough to construct tables and shelves for the club's Hornby Railway, storage cupboards for club stock and other useful articles.

Another very interesting example of a hobby with a double purpose that has just come to my notice is from the Plymouth M.C., which has a printing section. This began work in a very small way, but has prospered so well that to-day it produces well-designed and attractive leaflets for recruiting purposes, or giving details of Exhibitions and other events organised by the club. I am always ready to loan small blocks of Meccano models that would help to make leaflets and other literature of this kind attractive.

An Invitation from Australia

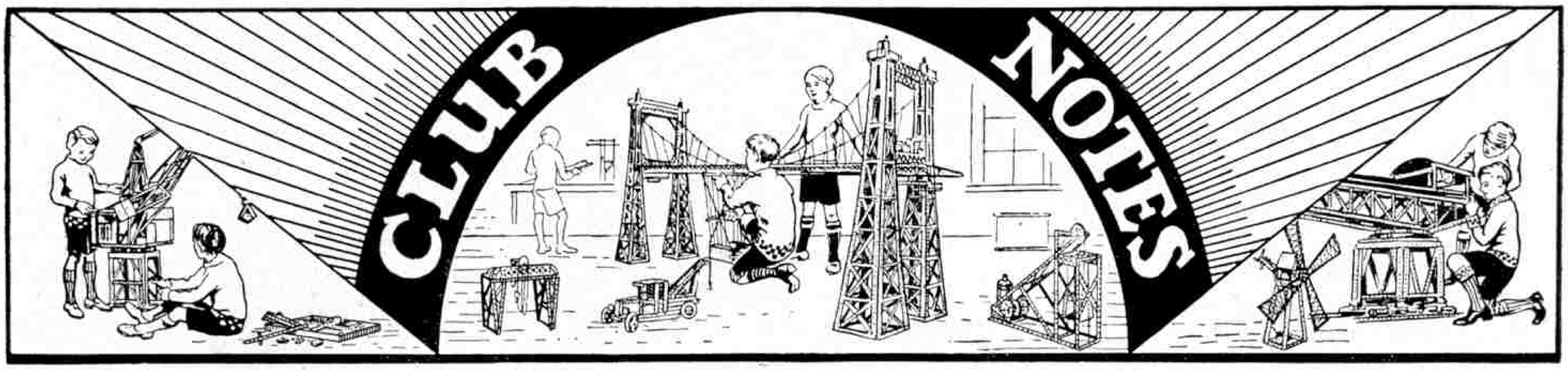
It is good to hear of well-deserved success in building up a strong Meccano club, especially in distant countries overseas, and I make no apology for referring here to the Maylands M.C., the home of which is in Perth, Western Australia. This club celebrates its third birthday next March, and during the short time it has been in existence has proved a wonderful rallying point for the Meccano boys of the district.

Much of this success is due to the wise and thoughtful leadership of Mr. Malmgreen, the founder of the club. One particularly gratifying feature is the close relationship between the club and the Maylands Branch of the Hornby Railway Company. A combination such as this is very strong indeed, and I should like to see every Meccano club follow this example from Australia by associating itself with a Branch of the H.R.C , or by forming one if at present the opportunity of combined working is denied them.

Mr. Malmgreen invites Leaders of other clubs in all parts of the world to write him short notes on their club activities, to reach him if possible during March. His chief object is to enable him to give visitors to the club evidence that it is part of a world-wide fellowship of Meccano boys. Apart from that, his invitation is one to which I should like a widespread response, for communication between clubs increases the interest and encourages the efforts of all.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:
HALIFAX—Mr. T. Brooks, 93, Highroad Well Lane, Halifax.
HALIFAX—B. Stead, 28, Carlton House Terrace, Halifax.
MORECAMBE—B. McConville, 32, Limes Avenue, Morecambe, W.E.
NORWICH—K. Fanthorpe, 132, Magdalen Street, Norwich.
SWINDON—A. Richards, 118, William Street, Swindon, Wilts.



Barking M.C.—Meetings are now held at the Central Hall. Membership is steadily increasing, but new members will be heartily welcomed, and those wishing to join should get into touch with the secretary at the address given below. It has been suggested that special Junior Section meetings be held monthly at the former club room. Club roll: 12. *Secretary:* H. Taylor, 45, Sherwood Gardens, New Barking, Essex.

The Beeches (Jersey) M.C.—A Christmas Card Scheme has taken up a great deal of the members' attention. This proved very successful, and the proceeds were added to the club funds. Lantern Lectures are proving a very popular feature of club life, and a very enjoyable Tea and Amusement Evening was held to celebrate the anniversary of the affiliation of the club with the Guild. Club roll: 20. *Secretary:* A. Shepherd, De La Salle College, "The Beeches," Jersey, C.I.

Breich M.C.—The members have been busily engaged constructing lockers for themselves, and installing electric light and heaters in their new club room. A visit was paid to the St. Giles Cathedral M.C. An Exhibition is to be held early in the New Year, and this will include a Cinematograph Show. Club roll: 10. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder.

Colchester M.C.—Senior members have constructed a fine Motor Chassis model, while the Juniors have built many smaller models, designed to increase their skill in model-building. The Hornby Railway Section have laid down two large tracks. One of the members has worked out a colour-light signalling system for incorporation in the layouts. The Photographic and Stamp Collecting Sections are very active. Club roll: 39. *Secretary:* F. V. Cole, 8, Priory Street, Colchester, Essex.

Cold Harbour M.C.—Members now have two rooms at their disposal, with new tables in each, and model-building is carried on with great enthusiasm. Lantern Lectures also are a popular feature of the club's programme. Club roll: 16. *Secretary:* R. S. Hill, Anstie Farm, Cold Harbour, Surrey.

Coloured Mission (Cardiff) M.C.—Additions to the club's stock of Meccano parts have enabled a splendid model of a Cargo Boat, complete with working derricks, to be constructed. The club celebrated its first Birthday at the end of November. An Exhibition is to be held early this month, and members have been kept busy preparing for it. It is probable that a private club room will be secured in the near future. This will be a great improvement, and the future of the club is distinctly encouraging. Club roll: 16. *Secretary:* D. H. Binstead, 37, Penhill Road, Llandaff, Cardiff.

Folkestone M.C.—Members have been busily engaged constructing new special type Meccano Cranes for handling heavy traffic on the club's Hornby Train layout. The platforms at "Ashford Junction" and "Folkestone Junction" have been extended, and the electric track has been fitted with new signals and tunnels, and various other accessories. A new ship has been built for Brighton Harbour, the club's other two ships being re-painted. Club roll: 7. *Secretary:* W. F. Cotter, 72, Dover Street, Folkestone, Kent.

Exeter M.C.—Attendances have been exceptionally good, the numbers shown on the club's indicator increasing with every meeting. Members have been busy constructing many varied and attractive models. A football team has been formed under the name "Elmside Rangers" and has made a promising start. Club roll: 50. *Secretary:* J. H. Fenwick, 28, St. John's Road, Exeter.

Great Baddow M.C.—This club has been holding very interesting meetings, with Games Nights proving exceptionally popular. Members who serve a year's continuous membership are to be presented with a blue and gold ribbon by the Chairman, and it is hoped to be able to add a bar for each year's service in the future. At the club's Annual General Meeting the balance sheet showed a good amount in hand, and the evening was concluded with a film display by one of the adult members of the club. Club roll: 23. *Secretary:* K. J. Avis, 5, Crescent Road, Great Baddow, Chelmsford.

Hornsea M.C.—Attendances have been exceptionally good, and a variety of Lectures of special interest have been given. Separate Social Evenings have been held for the Senior Scientists and the Junior Scientists, and also for the Senior Engineers and the Junior Engineers. Cinematograph Shows continue to be popular features of club life, and the Apprentices spent a very enjoyable evening playing games at the Leader's home. Club roll: 19. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Holy Trinity (Barnsbury) M.C.—The 18th Annual Exhibition attracted more than 200 visitors. The Rev. T. Darlington, President of the club, opened the Exhibition on the first day. The prize-winning Meccano models included a clock, coal cutter and bus chassis, and there were also splendid wood and fretwork models. The aeroplane models and the club's Hornby Train layout were excellent. The aerodrome was floodlighted, thus giving a very realistic appearance to the scene, and a novel idea introduced by the Railway Section was to organise night runs, the Hornby layout being illuminated by means of small bulbs fitted on the platforms. Club roll: 24. *Secretary:* Mr. H. C. Boys, 37, Mackenzie Road, Beckenham, Kent.

The football team of the Exeter M.C., with Mr. M. C. Hodder, Leader of the club. The member holding the ball is J. T. H. Fenwick, captain of the team and secretary of the club. An excellent fixture list has been arranged for the 1937-8 season, and a very promising start has been made.

Mall School M.C.—The varied and attractive programme arranged for the Autumn Session has been most enjoyable. It included such items as speed testing of Hornby Engines, a Treasure Hunt, which was arranged between three teams and took place in the playing field of the school, a General Knowledge Paper, and a Mock Trial, the latter being greatly enjoyed by all the members. Club roll: 30. *Secretary:* A. C. James, 45, Popes Grove, Twickenham, Middlesex.

Plymouth M.C.—Members of the Meccano and Woodwork Sections were extremely busy constructing various models and preparing for the club's Exhibition at the Upper Abbey Hall last month. This was opened by the Lord Mayor, and was a great success. Mr. W. Trace has kindly presented various Meccano parts to augment the club's stock. A Lecture on "*Modern Transport*" was given by Mr. R. Emdon, and one on "*York Railway Museum*" by R. Emdon and P. Frizzell, who showed slides kindly loaned by the L.N.E.R. The club has sustained a great loss by the death of Master R. G. Tubb, the club's second oldest member. A special Trophy has been instituted in memory of this boy. Club roll: 60. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

Stretford Public Libraries M.C.—There have been good attendances at practically every meeting. Lantern Lectures, to which friends of members were invited, have proved a very popular feature of the club's activities. Debates have been held, and several of the members have given excellent papers on subjects of interest. Model-building is carried on with great enthusiasm. In a display of general models the most outstanding were a large War Aeroplane, with a machine gun, a model of Pit Head Colliery Apparatus, and a Miniature Racing Car. A Stamp Section has been formed, and at one meeting the President's fine collection of British Empire stamps were greatly admired by the members. Gifts of stamps received by the Leader have been distributed among members. Club roll: 30. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester, 16.

AUSTRALIA

Maylands M.C.—A new Faction, the "Blue and Gold," has been formed. Model Displays have been attractive features of club meetings. Two exhibits of particular interest represented a Village and Wiluna Goldmine, and were constructed by the "Red and Blue" and "Green and Gold" Factions respectively. A Vaudeville Competition has been held, each of the Factions arranging a very good programme. The winners were the new Blue and Gold Faction, and this novel entertainment was greatly enjoyed by both the members and visitors. An interesting Lecture on the Suez Canal was given by the Leader. Club roll: 32. *Secretary:* M. Thomson, 13, Kennedy Street, Maylands, Western Australia.

INDIA

The Trinity (Madras) M.C.—This newly-affiliated club has been holding fortnightly meetings since January 1936. The President has kindly provided a large room so that more frequent meetings are possible. Model-building and model train operation are the chief activities of the junior members, while the seniors indulge in various indoor games. Outdoor games have been arranged with the Friends' United Club, Madras. Week-ends are chiefly devoted to model-building and other hobbies. Members enjoy building their models collectively, and the planning of layouts for the club's Hornby Railway. Club roll: 19. *Secretary:* S. Purushothaman, No. 6 Munia Pillay Street, Mount Road Post, Madras, India.

NEW ZEALAND

Christchurch M.C.—Membership is steadily increasing. "*The Coupling*" is now the official magazine of both the Christchurch and Ashburton clubs, thus strengthening the link existing between the two. An impromptu Mock Trial that took place when the members of the Ashburton M.C. visited the club caused a great deal of amusement. Meccano models were entered in contests at the recent Industries Fair by ten members, two of whom won prizes. Club roll: 37. *Secretary:* L. P. Chapman, 24, Braddon Street, Christchurch, S.W.1, New Zealand.

SOUTH AFRICA

Observatory and District M.C.—A successful Exhibition of Meccano and Fretwork models was staged at the Rochester Club House, and this was honoured by a visit from Col. Hornibrook and Mr. M. J. Adams. Members of the Meccano Section contributed some splendid models, including working models of an Electric Trolley Bus and Lathe, both built by H. Lamb. In the Fretwork Section a Hall Rack and Smoker's Cabinet built by G. Offen deserves special commendation. New members are heartily welcome, and any boys interested should get into touch with Mr. G. E. Barrett, President, at 45, Station Road, Observatory, South Africa.

Join THESE WORLD-WIDE FELLOWSHIPS OF HAPPY BOYS

PRESIDENT:
MR. ROLAND G. HORNBY

MECCANO GUILD

THE MECCANO GUILD

BADGE OF MEMBERSHIP

HORNBY RAILWAY COMPANY

A real railway company with boy directors and officials

To help and encourage Meccano boys

How to become a Member

Every boy who possesses a Hornby Train Set should join the Hornby Railway Company and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary, the Hornby Railway Company, Binns Road, Liverpool 13—and return this, together with a remittance of 6d. (Overseas 10d.) to pay for the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts, and their railway operations generally, as realistic as possible, and competent railway experts on the staff at Headquarters are continuously engaged in advising members how to make the best use of the material at their disposal.

Join a Local Branch

The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is possible for a single individual. Every member should join a Branch, or if one does not exist in his neighbourhood, he should try to induce other enthusiasts to help him to found one.

The Meccano Guild is an organisation for boys, formed with the object of making their lives brighter and happier and of encouraging them in the pursuit of their studies and hobbies. All owners of Meccano Outfits are eligible for membership. Each member has the personal interest of the President and is entitled to the friendly advice and assistance of the Secretary. He wears the triangular Meccano Guild badge, beautifully enamelled in blue and white, and is presented with a handsome membership certificate printed in orange and black, and undertakes to promote the great objects for which it was formed.

How to Join

All that is necessary to join the Guild is to fill up the form of application enclosed in all Outfits, and forward it to the Secretary, the Meccano Guild, Binns Road, Liverpool 13, together with a remittance of 7d. (Overseas 1/–, Canada 25 cents) to pay for the badge. The applicant is then duly enrolled and his certificate and badge of membership are sent to him. If desired, application forms can be obtained from the Secretary.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 187-189, Church St., Toronto. AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1. SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

Meccano Clubs

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. Every Guild member should join one if possible, for only in association with other Meccano boys is he able to obtain the greatest fun from his hobby. If the nearest club is too far away for him to join, he should consider the possibility of forming a new club in his own district. A special booklet entitled **"How to Run a Meccano Club"** is now ready, and will be sent to any reader (post free) on receipt of 2d. in stamps.

Branch News

ABERGAVENNY.—A new Branch room has been obtained, and a track laid down to represent in miniature the route over which *"The Royal Scot"* runs from Euston to Scotland. The main stations of the layout are lighted electrically. An Exhibition held during the Christmas holidays was a great success. Secretary: J. C. Baker, White House, Llanfoist, Nr. Abergavenny, Mon.

BEDFORD.—Meetings are now held weekly. Timetable operation is a special feature. The standard "Weekday" timetable covers a period of 45 minutes, and members are becoming expert in its operation. Several new members have joined, which has brought the membership of the Branch to its maximum number, and a new club room is now desired. An enjoyable visit was paid to the G.W.R. Old Oak Common Running Sheds, where engines of nearly every standard class, including *"King George V,"* were inspected. Several other visits have been arranged. An anonymous gift has been made to the Branch of a Hornby *"Royal Scot"* Electric Locomotive. This has proved invaluable in dealing with heavy expresses, and the officials and members of the Branch wish to express their sincere thanks to the donor. Secretary: A. W. R. Coomber, 33, St. Michael's Road, Bedford.

BURY ST. EDMUNDS.—Meetings have been devoted mainly to timetable working, at which good progress is being made. At one meeting suggestions were invited for improving the Branch layout, and this terminated in the presentation by one of the members of a new locomotive. This has been successfully introduced in timetable working, and is greatly appreciated by the members. The advisability of starting a Branch magazine was discussed. Extracts from *"The 'Coronation' and Other Famous L.N.E.R. Trains,"* by Mr. C. J. Allen, are read at various meetings. Locomotive Trials, Competitions and other pursuits have taken place, and it has been decided to hold another Table Tennis Competition. Secretary, T. S. West, 10, Crown Street, Bury St. Edmunds.

ELMSIDE (EXETER).—Excellent train services have been operated during recent meetings, but several accidents have occurred which might have been avoided by more careful handling. A story by Mr. Hodder, entitled *"The Grey Room Ghost,"* was immensely enjoyed. The present arrangements are to continue for the future programme of the Branch. Secretary: J. T. H. Fenwick, 28, St. John's Road, Exeter.

RYEFORD HALL (STONEHOUSE).—This Branch is run in connection with the school "Occupation Periods," when all older boys have to be engaged in some hobby. The Branch room is always open to members, and Hornby Train operation is the chief pursuit. Three independent circuits at present exist in the room. At present congestion is presenting difficulties, owing to the large membership, but it is hoped that this will be overcome in due course. Secretary: Mr. C. G. V. Taylor, Ryeford Hall, Stonehouse, Glos.

HORNSEA.—Interesting railway operations have taken place. The Apprentices greatly enjoyed a recent Evening when several brought their engines and the Branch layout was arranged with three tracks all round the room, *"The Flying Scotsman"* taking the middle track. The Junior Engineers also held a special Evening devoted to Hornby track operation, at which a Breakdown Crane was kept in readiness at one of the sidings in case of accident. The Senior Engineers' Evening was devoted chiefly to the operation of milk traffic, which was very heavy. The Riviera "Blue" Train was also run to timetable, and *"The Flying Scotsman"* was running as usual. Secretary: P. Richardson, "Summerleigh," Esplanade North, Hornsea, E. Yorks.

NORTHAMPTON.—Good progress is being made, and Branch Nights are held alternately on Wednesdays and Fridays of each week. Train operations are run to timetable, and very few accidents have been recorded. The track has been greatly improved by the addition of a continuous run to the centre portion, and a loop line has been added to the main through station at "Stafford." This has made possible more interesting working and locomotives can now be tested on continuous runs. The results of the Summer Photo Judging Competition were given, and the winners were P. G. Drage and G. L. D. Hodges, who secured first and second prize respectively. Secretary: P. C. Collier, 33, Sandringham Road, Northampton.

SWAN (KIDDERMINSTER).—The Branch track is in good working order, and experimental timetable runs have been very successful. One of the members has constructed an engine shed fitted for electric lighting, and has kindly presented it to the Branch. Signalling is carried on with a Morse tapper key, using the standard G.W.R. Bell Code. Several members visited the Model Railway Show at Birmingham. Table Tennis is an attractive feature of Branch life, and weekly Tournaments are held. A new Hornby Locomotive has been very kindly presented to the Branch by Mr. H. Blent, who was also the donor of a Hornby Engine last Christmas. Secretary: A. D. Hamblin, Black Bull Hotel, Swan Street, Kidderminster.

Members of the Northampton Branch No. 284. Chairman, Mr. G. L. D. Hodges; Secretary, P. C. Collier. Visits to railway centres are a prominent feature of the programme of this Branch, and our photograph was taken during an inspection of the Tyseley G.W.R. Locomotive Depot.

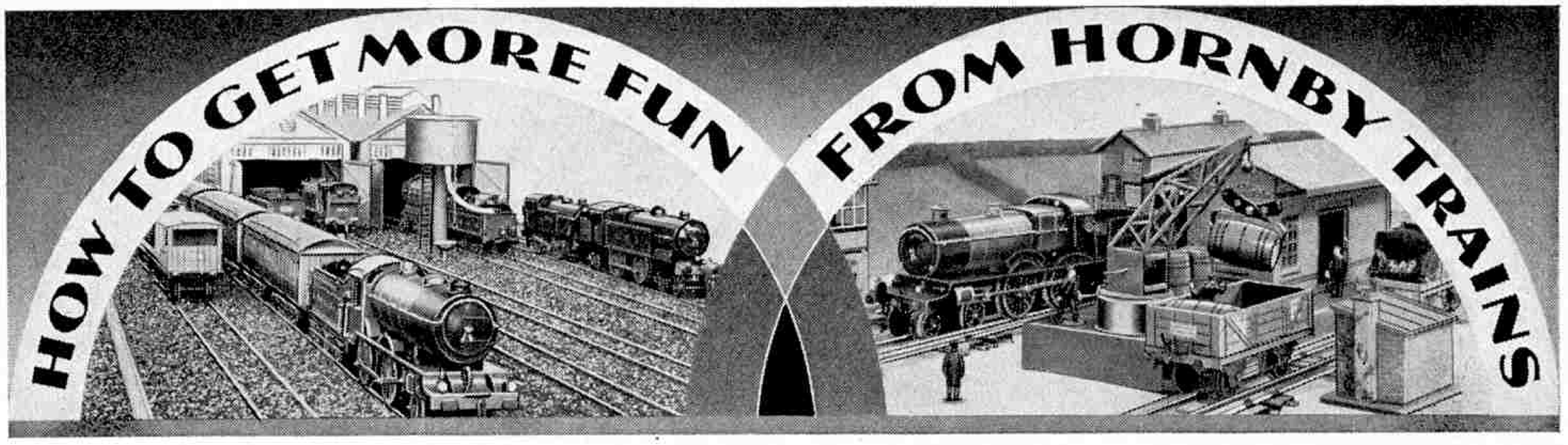
Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

ABERDEEN—G. F. Ritchie, 57, Springbank Terrace, Aberdeen.
BARNET—G. Chandler, 17, Manor Road, Barnet, Herts.
BRIDGEND—P. Parry, Bryntirion School, Bridgend.
BUNGAY—K. J. Sturt, 22, Upper Olland Street, Bungay, Suffolk.
DUNGANNON—C. H. Isons, Union Place, Dungannon, Co. Tyrone.
EDGBASTON—P. M. Jackson, 531, City Road, Edgbaston, Birmingham 17.
HINCKLEY—R. W. Jee, 23, Mount Road, Hinckley, Leics.
HURLFORD—B. Seright, The Manse, Hurlford, Ayrshire, Scotland.
JESMOND—P. A. Scarborough, 6, Tankerville Terrace, Jesmond, Newcastle-on-Tyne.
NORTH CHEAM—D. Tutton, 121, Matlock Crescent, North Cheam, Surrey.
SOUTHALL—D. Herbert, "Eildene," 13, Park View Road, Southall, Middlesex.
STOURPORT-ON-SEVERN—J. C. Perrin, "The Firs," Bewdley Road, Stourport-on-Severn.
THORNTON HEATH—P. Broughton, 70, Virginia Road, Thornton Heath, Surrey.
TUNBRIDGE WELLS—D. Quantrill, 25, Calverley Street, Tunbridge Wells, Kent.

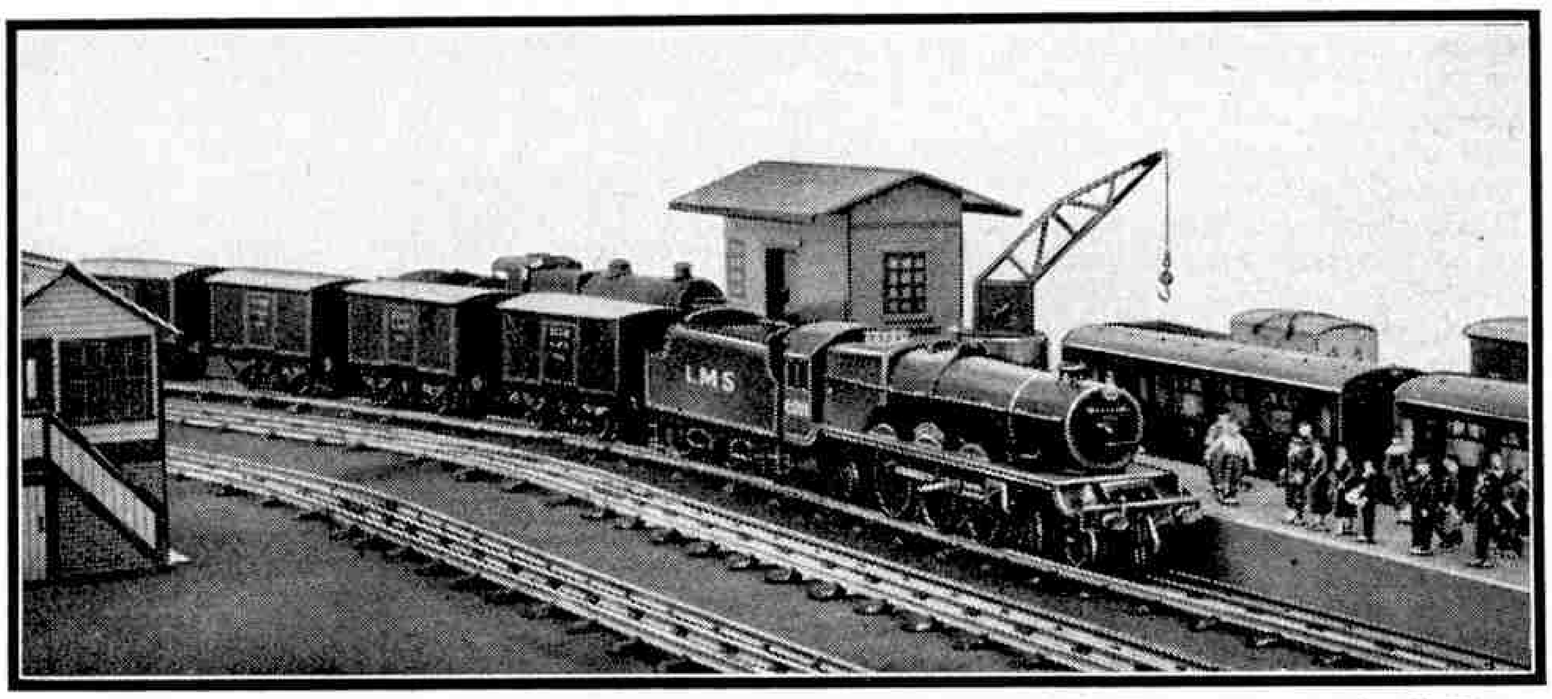
Branch Recently Incorporated

335. CAMBRIDGE—J. E. Gray, 25, Rustat Road, Cambridge.



SCOTTISH TRAFFIC WORKING

IT is traditional to associate the New Year with Scottish affairs, so this is a convenient time to deal with miniature railway schemes based on practice north of the Border. With the passage of time the once strong individuality of Scottish trains has gradually become obscured by the standardisation of equipment carried out by the L.M.S. and the L.N.E.R. This very progress, however, has resulted in some interesting developments that can be reproduced in a very realistic manner on a Hornby railway system.

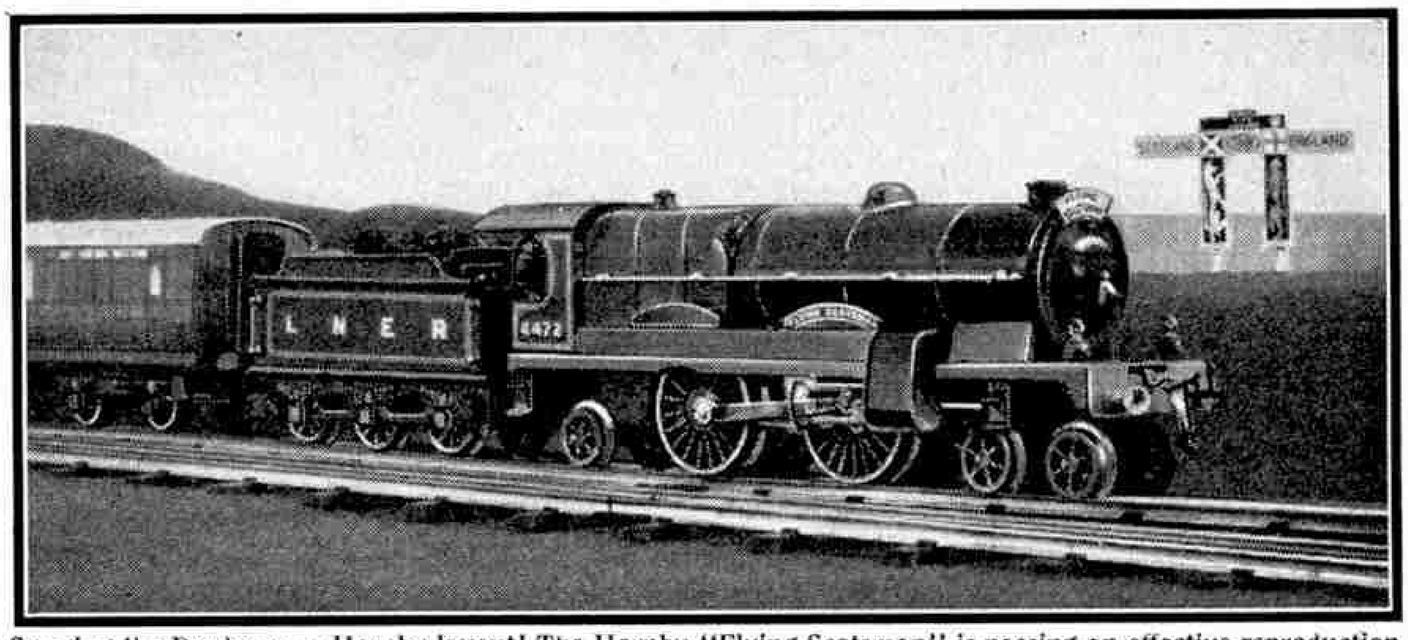


"Princess Elizabeth" at the head of a fast freight train made up with Hornby No. O Fish Vans to represent the "1.55 p.m. Fish" from Aberdeen. This train is sometimes hauled by locomotives of the "Princess" class.

The through traffic between England and Scotland is of the greatest importance, and probably most layouts north of the Border include in their services miniature reproductions of one or other of the famous trains connecting London with Edinburgh, Glasgow or Aberdeen. The best known and certainly the oldest of these trains are "*The Royal Scot*" of the West Coast Route, and "*The Flying Scotsman*" of the East Coast Route. A miniature "*Royal Scot*" train can be assembled correctly on a Hornby Railway with the new No. 2 Corridor Coaches; and the train can be provided with nameboards bearing its title, for these are included in the range available in the Hornby Series.

For locomotive power the splendid "*Princess Elizabeth*" is the obvious first choice, for the real "Princesses" were introduced for these very services and work throughout the 401.4 miles between Euston and Glasgow Central. If special attention is paid to the details of traffic working, and the train consists of a Glasgow and an Edinburgh portion, an intermediate stop can be made to represent the halt of the real train at Symington for division on the down journey, or for combining the two parts when travelling in the up direction. For the working of the Edinburgh vehicles the E220 Standard Compound type of locomotive is most suitable.

Part of a lengthy through working, from London to Aberdeen and back, with which both "Princesses" and "Royal Scots" are associated, is the haulage of a fast freight train up from Aberdeen as far as Carlisle. The train is the "*1.55 p.m. Fish.*" Its make-up is an easy matter to arrange with the new Hornby No. O Fish Vans, which are now available in L.M.S. style and finish and represent the latest pattern of vehicles for this perishable traffic. The upper illustration on this page shows a reproduction of the "*1.55 p.m. Fish*" on a Hornby layout. The engine on this lengthy turn is re-coaled at Carlisle in each direction, so it leaves its train to be taken on from there by another engine. This is a convenient arrangement to follow on a Hornby layout that is intended to represent only the section of the L.M.S. North of Carlisle.



Crossing the Border on a Hornby layout! The Hornby "Flying Scotsman" is passing an effective reproduction of the Border sign described on page 717 of last month's "M.M."

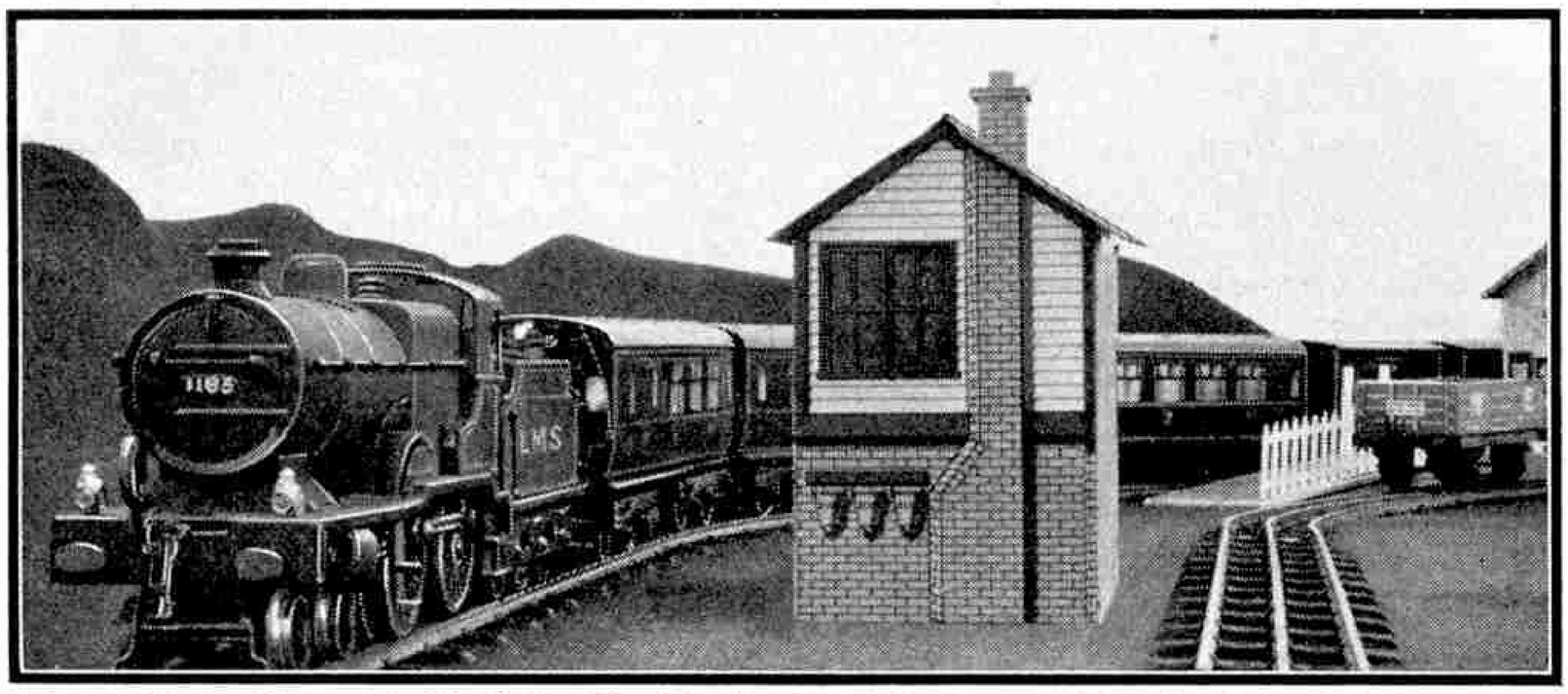
L.N.E.R. locomotives also make notable endurance records on the longest non-stop run in the world, that of "*The Flying Scotsman*" between King's Cross and Edinburgh, a distance of 392.7 miles. For assembling this famous train in miniature the new Hornby L.N.E.R. No. 2 Corridor Coaches are ideal, for their tinprinted details

reproduce exactly the characteristic finish of the real vehicles. The non-stop running of this train during the summer period is easy to carry out on a continuous electrically-operated Hornby railway. For systems where clockwork is the motive power the winter working of this train with intermediate stops is most suitable. The smart start-to-stop running of clockwork engines represents very well the sharply-timed sprints that now have to be made by the real locomotives on this service.

On a Hornby railway the vehicles forming *"The Flying Scotsman"* also can be furnished with Train Nameboards bearing this famous title. An interesting accessory carried by the engines on this train is the front nameboard with the words *"Flying Scotsman"* on it. It is easy to make up a miniature board of this kind from a piece of white card. The board is rounded to match the curve of the locomotive boiler, a favourite position for its display being the top lamp bracket. The lower illustration on page 52 shows how effective such a board looks when placed on the front of a Hornby locomotive.

Lineside features that are of interest to L.N.E.R. enthusiasts are the Border signs recently erected a little to the north of Berwick-on-Tweed. These signs mark the exact spot at which the railway crosses the Border between England and Scotland, and they were fully described and illustrated on page 717 of the *"M.M."* last month. It is not difficult to make up a miniature sign of this kind. Fairly thick cardboard should be used, and supports of thin wood should be attached to the back of the "legs" of the sign, and made to project downwards. These supports can be attached to a suitable base, also of wood or card, but on a permanent system they could be planted in the model "earth." The painting of the details of the sign is not really a difficult task, and full particulars of the colours used were given in the description previously referred to. The lower illustration on the opposite page shows how effective a miniature sign of this kind can be.

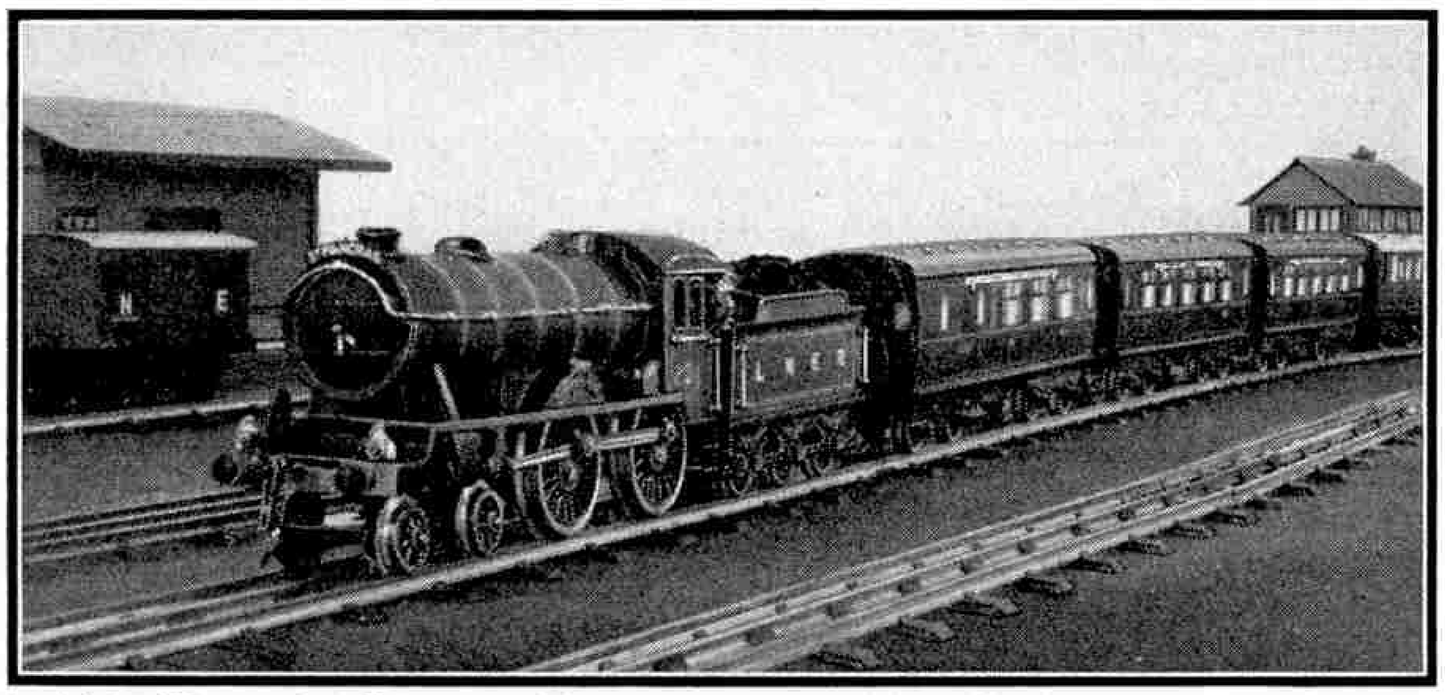
Interesting joint working is practised in the operation of the *"Thames-Forth"* services between London and Edinburgh by the Midland and Waverley routes. L.M.S. metals are traversed between St. Pancras and Carlisle, but from Carlisle to Edinburgh the route is L.N.E.R. The composition of the *"Thames-Forth Express"* is interesting, as it includes both L.M.S. and L.N.E.R. vehicles. The running of such a train in miniature therefore forms a good opportunity for the use of the stock of both companies, and the new Hornby Corridor Coaches in L.M.S. and L.N.E.R. styles are exactly what is required. They should be distinguished by the addition of nameboards bearing the words *"Thames-Forth Express,"* which can easily be made of strips of card.



A Hornby Standard Compound with a train of No. 2 Corridor Coaches leaving a wayside station. The single-track main line and the equipment generally are representative of the Stranraer route of the L.M.S.

Both L.M.S. and L.N.E.R. engines are used, each over their own particular part of the route, and on a Hornby railway the well-known Standard Compound model of the L.M.S., and *"The Bramham Moor"* of the L.N.E.R., can be employed over their respective sections. An unusual feature that is more or less peculiar to the engines of L.N.E.R. expresses in the Scottish Area is the display of a destination board on the smoke-box front. This is a custom that has been handed down from the days of the former North British Railway. A curious point is that on the up journey of the *"Thames-Forth Express,"* as the ultimate destination of the train is London, the L.N.E.R. engine displays a board bearing the words "St. Pancras," a destination that the engine itself will never reach!

One of these typical destination boards should certainly be carried by the engine hauling a miniature *"Thames-Forth Express."* It is not difficult to make one, and the lower illustration on this page shows its striking appearance on the smoke-box front. The board can be of metal or card, with a small "loop" attached at the back to allow it to be mounted on the lamp bracket in front of the engine chimney.



A miniature "Thames-Forth" express. This is made up of No. 2 Corridor Coaches L.M.S. with an L.N.E.R. Coach in the rear. The locomotive carries a destination board of the kind referred to in this article.

A Scottish route of the L.M.S. that is of particular interest is the Ayr and Stranraer line, and for various reasons it is very suitable for reproduction in miniature. Much of the track is single, a point that will appeal to many model railway owners.

The latest L.M.S. corridor rolling stock is to be seen on the line hauled by Standard Compound locomotives. Readers will remember the run of No. 914 from Stranraer to Glasgow described in the *"M.M."* in February 1936. The Hornby L.M.S. E220 and No. 2 Special Locomotives and the No. 2 Corridor Coaches can be employed effectively on a miniature Stranraer line.

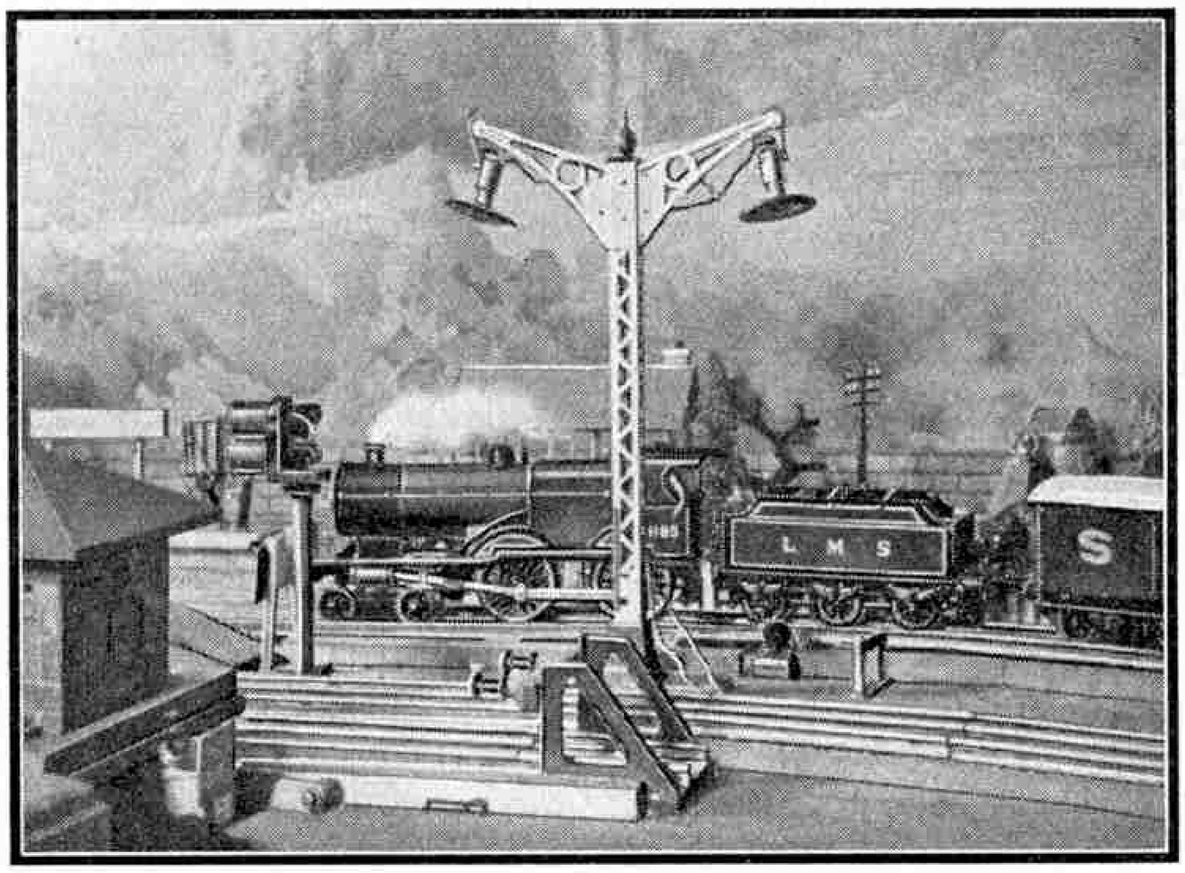
A Notable Hornby Railway

Layout with Realistic Lineside Features

A REMARKABLE feature of the miniature railway hobby is its many-sided character. The owner of one layout may specialise in the reproduction of the general features of an actual section of line. Another system may have been developed to allow of the working of an intensive time-table programme, and on others special attention may be given to complete signalling arrangements. Whatever the chief interest of a layout may be, however, it should be given a correct setting, with the various lineside features of actual practice as accurately reproduced as possible.

The illustration on this page of parts of the Hornby railway system of Mr. E. Lightfoot, Bromley, show what remarkable effects can be obtained with careful planning and a judicious arrangement of scenic surroundings. The railway, which includes 180 ft. of track, is arranged permanently on a raised platform in a room 16 ft. square. The main line is continuous, and consists of double track throughout arranged in the favourite oval formation. An interesting point is that at one end of the system the line does not follow the adjoining wall, but pursues a winding course that gives a very effective appearance.

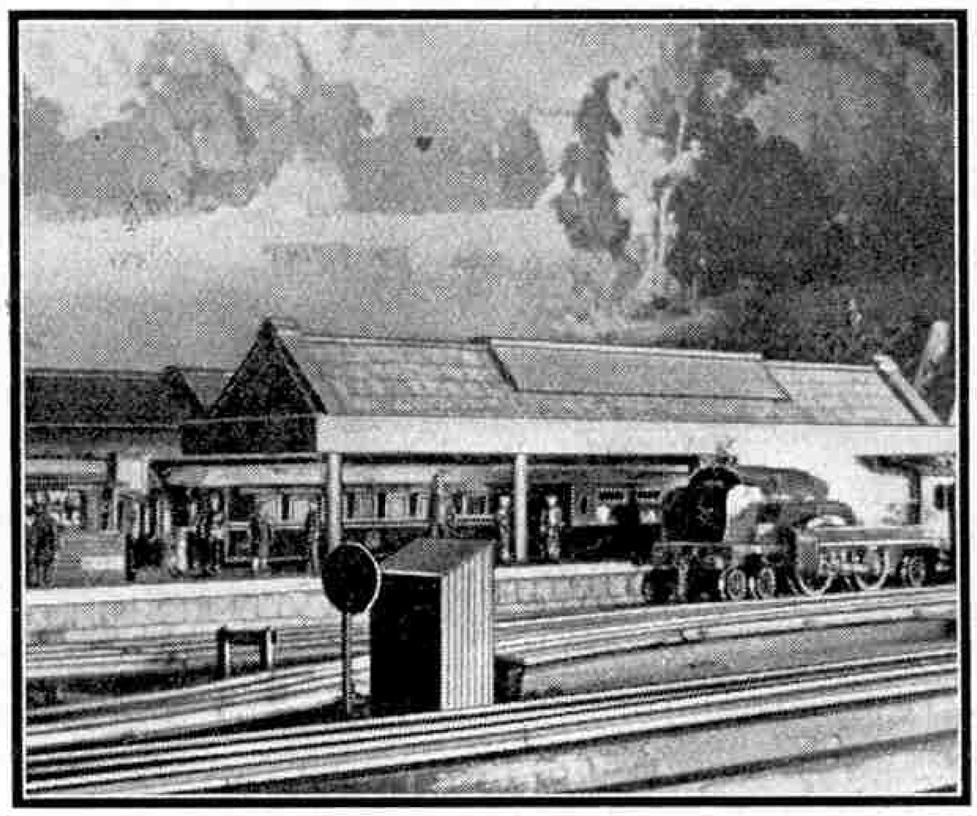
There are two stations, situated on opposite sides of the layout, and the larger of the two is provided with a system of sidings connected to an engine shed. There are in addition other sidings in the centre of the space occupied by the line, and these are accommodated on a section of the baseboard that is made to jut out into the central operating space.



A train approaching the main station on the Hornby Railway of Mr. E. Lightfoot, Bromley, which is remarkable for the ingenuity and realism of its scenery.

Probably the best way to appreciate the many attractive features of the layout will be to make an imaginary journey round it. In the main station, known as "Central," we find our train already drawn up at the platform. This is a corridor dining car express consisting of Hornby No. 2 Saloon Coaches and a Hornby Riviera "Blue" Dining Car. The inclusion of the Dining Car adds a very real air of importance, and the appearance of the train as a whole is very fine, all the vehicles being correctly gangwayed up throughout with Hornby Corridor Connections. The use of the open-type cars, represented by the No. 2 Saloon Coaches, and a restaurant vehicle reproduce the most modern practice in the composition of luxury expresses.

The train is evidently a popular one, for the platform is crowded with passengers and their luggage. We find that the engine is No. 3821, the 4–4–0 *"County of Bedford."* With its copper-capped chimney, brass-coloured safety valves and shining green paint, it is a very fitting engine to haul our splendid train on its journey.



A view of the main station. The vehicles forming the dining car express referred to on this page can be seen alongside the platform.

The traffic on this system is controlled by means of two-aspect colour-light signals, and when the starting signal at the end of the platform shows a green light we move off and soon plunge into a tunnel. Once through this we begin to gather speed. Running through some pleasant miniature rural scenery we pass a recreation ground, a picturesque spot with a gardener mowing the grass and several people sitting under trees in the shade. Some sidings diverge on our left, and almost as soon as we have negotiated the facing points, we rumble over a short underbridge. After a succession of fields bordering the track on each side, we approach a passing station, but do not stop. Probably a stopping train following our own is expected, as in the station yard there are various people making their way to the booking hall and there are cars waiting for expected passengers.

There is a permanent way slack in force ahead of us and slowing down we pass through a section under repair. The permanent way gang is busy here re-ballasting the down track and we see some of them busy by a brazier near a platelayer's hut. It is fortunate in a way that we have had to slow down here, for immediately afterwards we see a hunt in full cry over the fields, with the fox doing its best to shake off the hounds. Pasture lands follow and we notice many well-fed horses and cattle busily cropping the grass. Some distance away from the line is an aerodrome, with the usual long line of hangars and equipment, and various aircraft on the landing ground.

An overhead signal cabin is an unusual feature of the line here. We next cross another short bridge and pass a well-equipped and evidently prosperous farm, with the usual stacks and a variety of farming implements and machines in the yard. By now we are approaching an important station, and as we round the curves into it we notice that the main platform is an island, a dead-end line for local traffic being served by the opposite face of the platform used by the main line trains. There is a loading bank in the yard chiefly intended for farm produce. The sidings contain a variety of goods vehicles, evidently loaded with local produce in numerous casks and milk cans.

We complete our inspection of this remarkable system by paying a visit to the engine shed. This is a large modern building with electric lighting, and there are various engines on the premises, including the Hornby E220 Standard Compound that is shown in the upper illustration on this page, and the No. 3 type Locomotive seen in the lower photograph. A chat to the shed foreman results in the news that heavier engines can now be accepted on the line, since a new underbridge recently built near the aerodrome is sufficiently strong to take a Hornby *"Princess Elizabeth"* Locomotive, and it is hoped that one of these magnificent engines will be added to the already extensive stock before long.

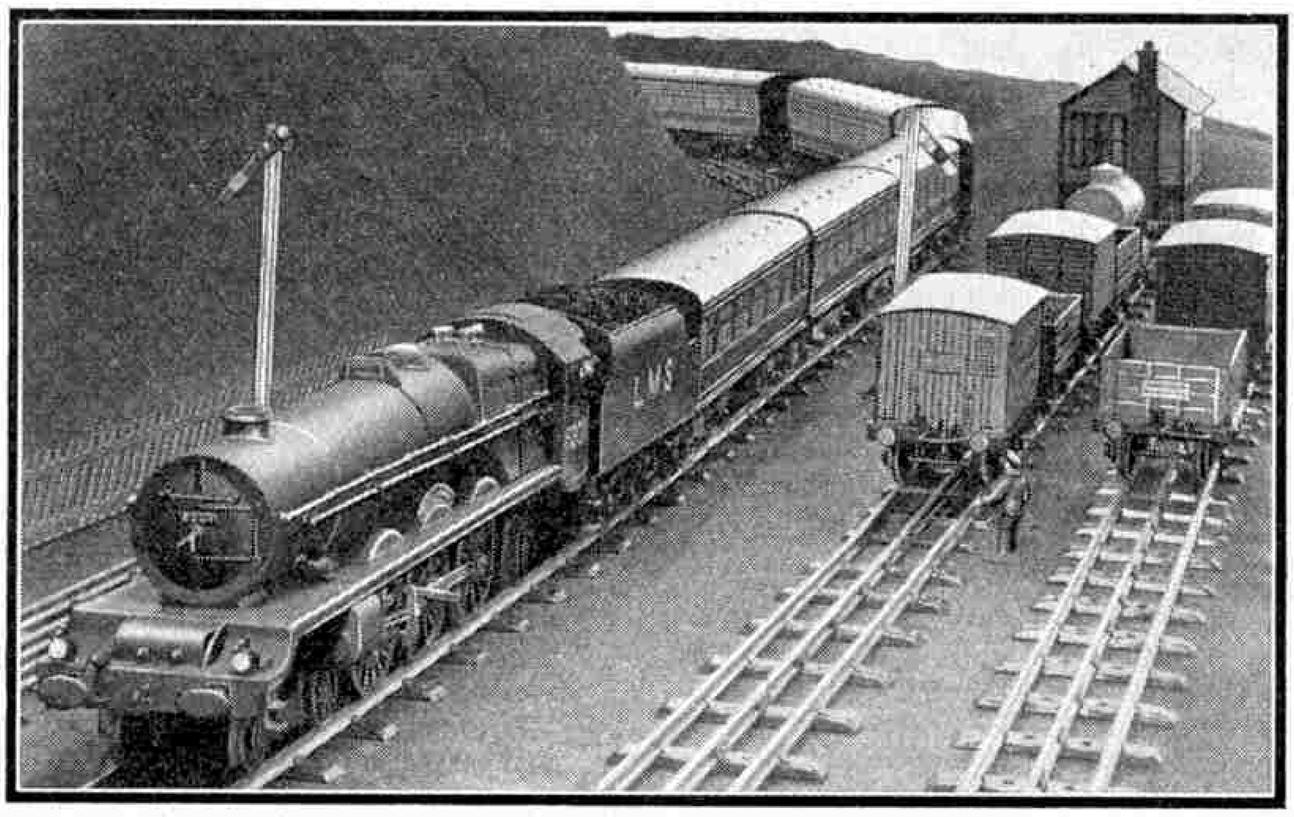
The layout is electrically operated and electric lighting is a feature of the station yard and other premises. Each track has its own separate transformer so that complete and independent control of the up and the down trains is afforded. The railway is naturally a constant source of interest, not only to the owner, but also to others in the district.

The New Hornby Solid Steel Track

Ideal Permanent Way for Electric Layouts

By "Tommy Dodd"

I AM sure that all readers of the "*M.M.*," and certainly all Hornby Railway owners, will be interested in the new Hornby Solid Steel Track that has recently been introduced. This provides owners of miniature electric railways with a perfect permanent way. It has been specially introduced to allow the fullest advantage to be taken of the power and speed of the wonderful Hornby 4-6-2 locomotive "*Princess Elizabeth*," and of other large Hornby electric engines. The Straight Rails are long, and the Curved Rails have a wide sweep, their radius being 3 ft. 2 in., measured to the outer rail. Thus the track is ideal for six-coupled locomotives, and its components have been carefully planned to be adaptable and to give neat and realistic layouts.



This photograph gives a good idea of the realistic appearance of the new Hornby Solid Steel Track. Its design and construction reproduce closely the latest permanent way practice.

The solid steel rails of the new track are of a strong and realistic section, and they are coated with zinc in order to prevent rusting and to ensure good electrical contact. Sleepers of pressed steel support the rails, so that the latest type of real permanent way construction is represented, the miniature sleepers closely resembling the trough-section steel sleepers of real practice. There are no supporting chairs, but special lugs are pressed up in each sleeper to grip the rails. Thus the general appearance of the assembly suggests the real practice of using metal sleepers with the chairs welded to them. The centre rail is held in the same manner as the running rails, but with a piece of insulating material inserted between it and the sleepers. This rail is arranged on the "all-level" system.

Each Straight Rail is just over 23 in. long, with 12 sleepers. This gives a most realistic appearance to the track, as can be seen from the photograph reproduced on this page. Straight Half and Quarter Rails also are available, and joints are made by means of strong Fishplates of spring steel, which grip the lower part of each rail very firmly and keep the track in perfect alignment. Fishplates are supplied with each rail.

The Curved Rails are similar in construction to the Straight Rails, and 10 of them form a complete circle. Curved Half Rails also are made, and these fulfil a useful purpose to which I shall make reference later in this article. The curved sections are fitted with the same sleepers as the straight lengths, no banking or super-elevation being provided.

The new Points are particularly interesting in design, for the arrangement of the switch rails, and of the check rails and crossing element, follows real practice very closely. The points are of the ordinary turnout kind, and are made in two patterns, right-hand and left-hand. Separate sleepers are not employed, but rigidity and perfect alignment of the various parts are ensured by the solid base that is used.

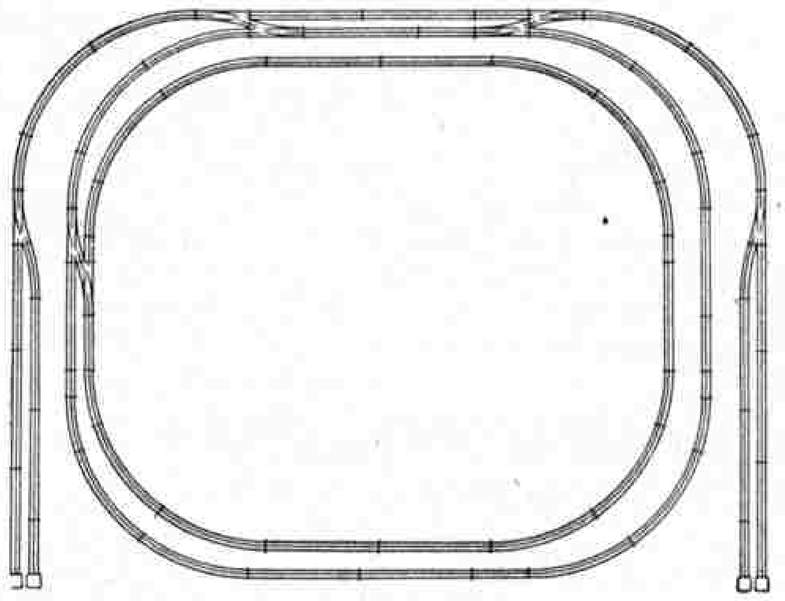
At the crossing of the points, that is where the actual divergence of the two routes takes place, the "V" shaped frog, and the rails alongside it forming the wing rails, are combined in one die-cast unit. This makes it impossible for the various components of the crossing to get out of alignment.

The layout diagram on this page shows very well the relation between the various solid Steel Track components. As 10 Curved Rails form a circle, it is necessary to make use of Curved Half Rails if a quarter-circle is to be laid down to join up two lengths of straight track at right-angles to one another. Thus at each corner of the layout illustrated there are two full length Curved Rails and one Curved Half Rail.

Special double track rails with common sleepers are not included in the solid Steel Track range, but quite satisfactory double track main lines can be made up of two single tracks. The inner main line in the diagram is assembled in this way. As the curves of both inner and outer tracks are of the same radius, the necessary adjustments between the lengths of the inner and outer straight tracks are made by means of half and quarter-length rails.

The Points have a definite relation to the curves and to the straight lengths of rail. The straight portion of a set of Points is equal in length to a Straight Half Rail and the curved portion also corresponds in length and radius to a Curved Half Rail. An interesting feature is that when two Right-hand or two Left-hand Points are used together on adjacent tracks, they form right-hand or left-hand single crossovers, in which the distance apart of the straight tracks is exactly the same as in Hornby Tinplate Double Track. The levers of the Steel Track Points are arranged inside the curve, but they are so placed that they do not foul the adjacent track when the Points are used in this manner.

Sidings and loop lines can be arranged equally readily by means of the new Points, and the manner in which this is done is illustrated on both sides of the layout diagram on this page. A Curved Half Rail added to the curved turnout of the Points to make a reverse curve brings the diverging track parallel to the main track. The insertion of a Straight Half Rail in the straight track at the trailing end of the Points then causes the rail joints of the parallel tracks to come opposite each other. This is a great convenience when buffer stops are to be arranged at the end of siding roads, as in the diagram, a neat and tidy arrangement being obtained. Loop lines can be made up in a similar manner.



A diagram of a layout made up of new Hornby Steel Track, showing how the components fit in with each other.

No doubt many owners of Hornby Railways who already have Hornby Tinplate Track in use will want to add the new track to their layouts, and special Adapting Pieces consisting of short lengths of rail are available for this purpose. There is a difference in height between the two types of track, so that the Steel Track has to be packed up for a short distance in order to raise it gradually to the level of the tinplate Rails.

It is also necessary to use these Adapting Pieces when any of the Hornby Accessories that incorporate lengths of tinplate track are included in the layout. These Accessories include Buffer Stops, of both hydraulic and spring types, the single and the double track Level Crossings, all types of Hornby Engine Sheds and the Hornby Viaduct.

The amount of space available is an important matter when any layout is being planned, particularly with regard to the width as this determines the radius of the curves that can be used. The simplest of all continuous layouts that can be arranged is the plain circle. In order to accommodate a circle, or an oval layout with semi-circular ends, a width of 6 ft. 8 in. is necessary when using Steel Track.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

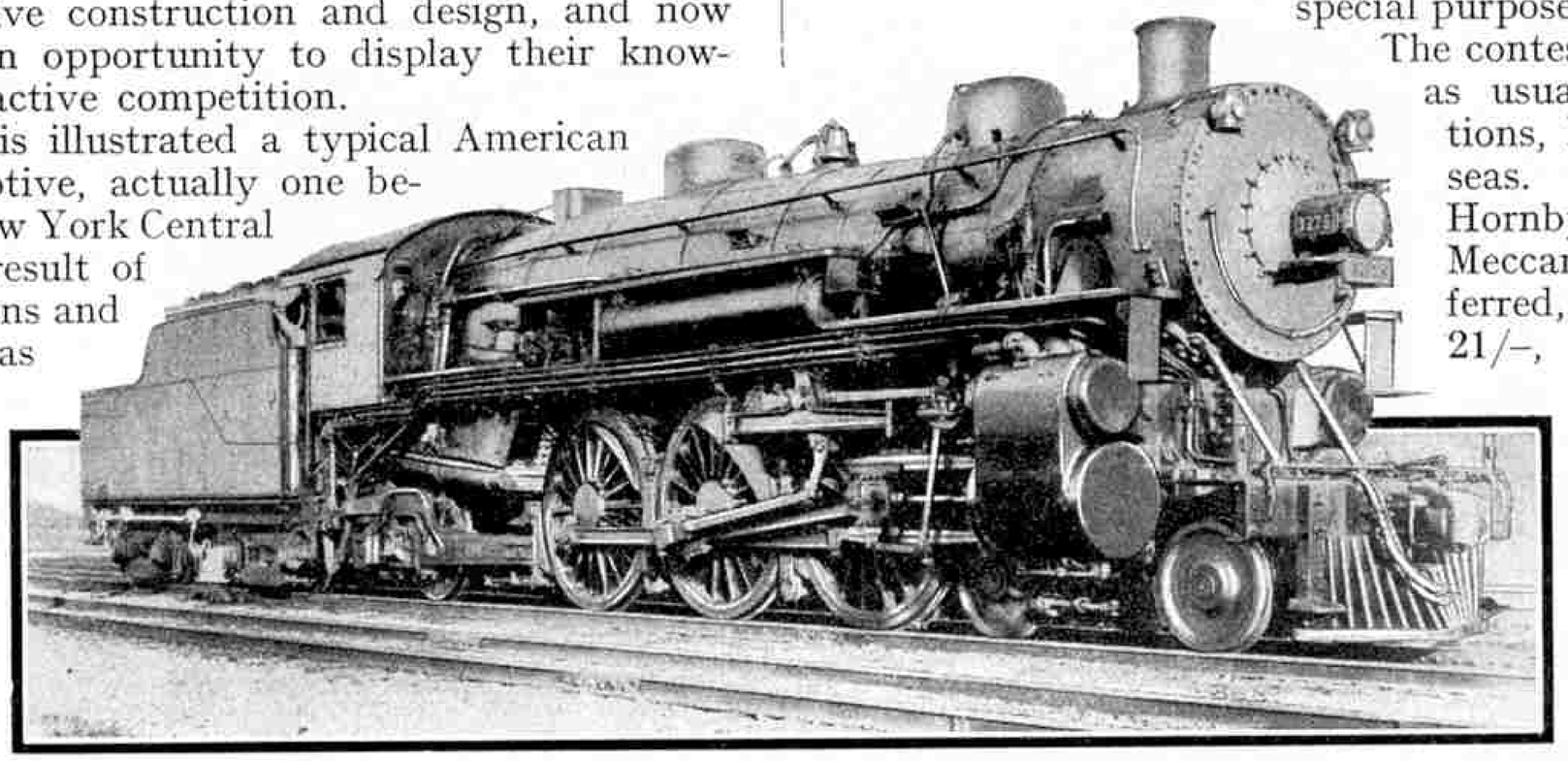
H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

LOCOMOTIVE FEATURES CONTEST

This month we return to a type of contest that has always proved popular with H.R.C. members. We know that readers are keen observers of the details of locomotive construction and design, and now we give them an opportunity to display their knowledge in an attractive competition.

On this page is illustrated a typical American "Pacific" locomotive, actually one belonging to the New York Central Railroad. As a result of different conditions and requirements it has characteristic features in which it differs considerably from the locomotives in Britain and other countries. Many of these are apparent in the photograph. For instance, the engine has the bell and the headlight that are standard equipment of every main line locomotive in the United States. In many parts of the country the tracks are completely open and unfenced, with open road crossings, and the bell is fitted to warn people of the approach of a train. The headlight gives the engineer, or driver, a clear view ahead at night.



How many features characteristic of locomotive practice in the United States can you detect in this illustration? Details of an interesting competition based on this photograph are given on this page.

Competitors are asked to make a list of such features as these, in which American locomotives in general differ from those of Great Britain. Only those details that are evident from the illustration must be included in the list, and in each case a brief description of their special purpose should be given.

The contest will be divided as usual into two sections, Home and Overseas. Prizes of any Hornby products, or Meccano goods if preferred, to the value of 21/–, 15/– and 10/6 respectively, will be awarded to the three competitors in each section whose list is most complete or accurate, but the prizes will not necessarily be awarded for the longest lists. In the case of a tie for any prize preference will be given to the competitor whose entry is presented in the neatest or most novel manner.

Envelopes containing entries must be clearly marked in the top left-hand corner *"H.R.C. January Locomotive Contest"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before January 31st. The Overseas section closing date is April 30th.

Voting Contest

This month we invite members to tell us which of the 12 main contests held during 1937 they liked best. A voting contest of this kind is arranged annually in order to help in planning an attractive programme for the coming year. Last year's result showed that every regular type of competition was strongly supported, and it will be interesting to see if there has been any change in popular opinion.

We should like every member of the H.R.C. to enter this special contest. All that he is asked to do is A, to say which of the main contests of 1937 he preferred, and B, to place in order of popularity the eight that he thinks will prove to have been most attractive. It is not necessary for him to include his own favourite in the eight forming his list in the second part of this contest, if he thinks it will not receive general support.

Prizes of Hornby Trains or any of the Meccano products to the value of 21/–, 15/– and 10/6 respectively will be awarded to the three entrants in each section, Home and Overseas, who give the most accurate forecasts of the solution. In the case of a tie, neatness and novelty of presentation will be taken into account.

A number of consolation prizes also will be awarded to those whose entries, while not of the highest standard, are considered by the judges to be deserving of some recognition.

Envelopes should be marked *"H.R.C. Voting Contest"* and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before January 31st. The Overseas closing date is April 30th. Membership numbers must not be omitted from entries.

COMPETITION SOLUTION

September Mystery Stations Contest

Sampford Courtenay (S.R.); Longniddry (L.N.E.R.); Ystrad Mynach (G.W.R.); Treherbert (G.W.R.); Cunninghamhead (L.M.S.R.); Auchterarder (L.M.S.R.); Billericay (L.N.E.R.); Llanfairfechan (L.M.S.R.); Walton and Anfield (L.M.S.R.); Thatto Heath (L.M.S.R.); Bugle (G.W.R.); Haslemere (S.R.); Chequerbent (L.M.S.R.); Prestonpans (L.N.E.R.); Meopham (S.R.); Sanderstead (S.R.); Ystradowen (G.W.R.); Egloskerry (S.R.); Cheltenham (G.W.R. and L.M.S.R.); Carlisle (L.M.S. and L.N.E.R.); Strata Florida (G.W.R.); Bloxwich (L.M.S.); Sawbridgeworth (L.N.E.R.); Hemyock (G.W.R.).

COMPETITION RESULTS

HOME

October "Missing Words Contest."—First and Second Tie: K. GANDY (7571), Sheffield 8, and M. SMITH (24126), Weymouth. Third: W. WEST (50155), Conisboro', Yorks. Consolation Prizes: R. R. MASON (2876), Ashby-de-la-Zouch; J. C. BUTTON (10335), Crewe, Ches.; E. R. DUDLEY (37680), Carshalton, Surrey; J. T. FRASER (2267), Exeter; C. E. WRAYFORD (6039), Bovey Tracey, Devon; W. W. POLLARD (45922), Datchet, Nr. Slough, Bucks.; J. W. C. LOWE (25627), Clacton-on-Sea, Essex.

October "Drawing Contest."—First: F. MILLS (31), Kearsley, Nr. Bolton. Second: C. J. THEEDOM (48607), Chelmsford, Essex. Third: A. SUNDERLAND (52500), Cheadle Heath, Stockport, Ches. Consolation Prizes: G. A. CULL (54626), Highgate, London, N.6; H. G. HENDERSON (50982), Beckenham, Kent; A. F. BAILLIE (54316), Stratham, Lanarkshire; D. Mc. G. CLARKE (54128), Liverpool 15; H. COULSON (47536), Mansfield, Notts.; A. COUTTS (54027), Allerton, Liverpool 19; S. J. FIDDLER (47026), Kentish Town, London, N.W.5; V. R. YOUNG (44359), Widnes, Lancs.

October "Questions Contest No. 9."—First: J. C. BUTTON (10335), Crewe, Ches. Second: J. L. MAKIN (30933), Allestree, Derby. Third: K. E. MILBURN (26029), Chingford, London, E.4.

OVERSEAS

July "Missing Links Contest."—First: W. S. EAGLE (31779), Byculla, Bombay, India. Second: I. BROUGH (9112), Balwyn E.8, Victoria, Australia. Third: R. PEARSON (29199), Richmond E.1, Victoria, Australia. Consolation Prizes: H. C. KEY (24764), Calcutta, India; R. A. WRAGG (7913), Bandikui, Rajputana, India; D. MURISON (37642), Buenos Aires, S. America.

July "Railway Photographic Contest No. 4."—First: A. A. SHAWKY (53749), Giza, Orman, Egypt. Second: T. WATSON (18065), West Leichhardt, N.S.W., Australia. H. BENNETT (10615), Auckland, S.W.1, N.Z.

Railway Developments in South Africa

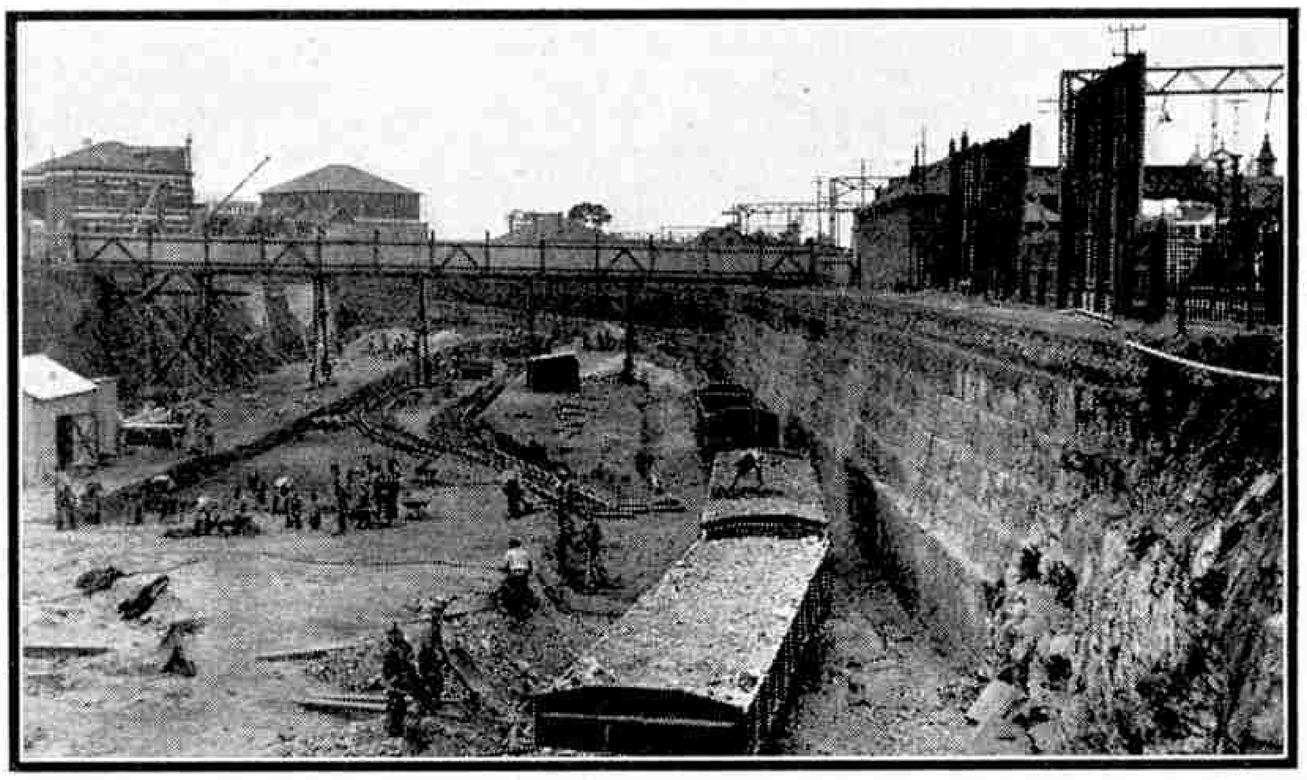
Suburban Electrification at Johannesburg

By C. P. Barnard

THE South African Railways and Harbours have decided to introduce electrified working for suburban passenger traffic between Johannesburg and Pretoria, and in the Reef area, in order to cope with the very large increase in traffic. At the same time it has been decided to proceed with certain other works that have been under consideration for some years.

The improvements to be carried out include the lowering of the line at Jeppe, a suburban station about three miles east of Johannesburg, and also at Mayfair, about two miles in the opposite direction. The object of these changes is to eliminate several crossings which occasion long delays to road traffic at peak periods. In addition the alignment of the route is to be improved by building deviations, which will eliminate a number of curves. At Langlaagte there will be a "fly-over" junction, on which trains will run at three different levels, and additional tracks are to be laid to meet the requirements of increased traffic.

The work calls for much skill and forethought, and great credit is due to the engineering staff of the Administration for the able way in which it has been planned and is being carried out. Hardly a mile of the Reef lines can be covered without some phase of constructional work being revealed to an always interested travelling public, and yet trains are being run to normal schedules, and specials are operated as and when required by traffic.



Work in progress at Jeppe near Johannesburg, on the electrification scheme of the South African Railways. The wagons are loaded with rock that has had to be blasted away.

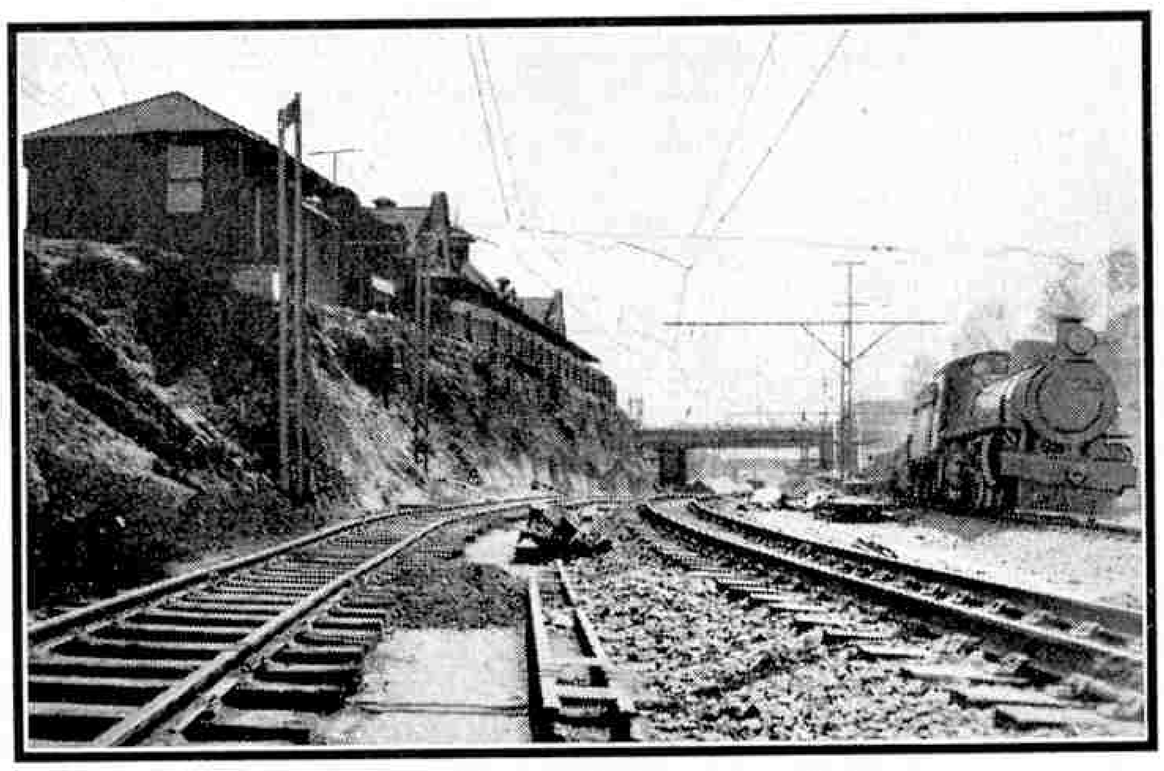
The total quantity of earth to be excavated at Jeppe is approximately 300,000 cu. yds., and at Mayfair 232,500 cu. yds. The excavations at Mayfair, although not as costly as those at Jeppe, where rock has been encountered practically all the way, are much more formidable from an engineering point of view. A trench for a retaining wall had to be excavated, and when this had been done and the wall built, the earth was removed for the first track on the low level. The old "up" track was then lifted, and excavations for the next road begun, the soil being removed gradually and taken by rail further along to points where embankments will be built for deviations.

Mechanical shovels and large gangs of natives have been working night and day to complete the task and order is at last appearing where to the onlooker all formerly appeared to be chaos. Four tracks will be laid in a huge cutting where previously two tracks ran along the surface. The old Mayfair station is to be demolished and a new one is to be built on massive steel girders overlooking the track. To erect the station buildings alongside the tracks, as is customary, is out of the question, for important roads flank both sides of the railway line and the cost of the adjoining land would be very high.

The rock at Jeppe had to be removed by means of explosives, and the necessary blasting operations were carried out at times when traffic was slack. Our upper illustration shows the scene of this work, with wagons loaded with rock ready to be taken away. A new station also is to be built there, and altogether eight new stations will finally be erected, either as a direct result of the new works, or to meet the demands of increased traffic.

Signalling alterations are also being carried out, and eventually the whole Reef area, from Randfontein to Springs, a distance of 58 miles, will be controlled by colour-light signals instead of the present semaphore system. Level crossings are being eliminated as far as possible, and the net result of the Administration's efforts combined with those of local authorities is that eight of these crossings will be replaced by overhead bridges or subways.

Electric power for the trains is supplied to 12 sub-stations situated at intervals along the line. The pressure is 40,000 volts. At the sub-stations this is stepped down to 3,000 volts, and is then fed to catenary wires suspended from overhead masts by means of double insulators. From these wires the current is passed to the contact wire, and picked up by the pantographs of the electric motor coaches. The circuit is completed by way of the running track, which returns the current to the power station. In view of the large number of crossings encountered, the only possible means of transmitting power to the electric trains is by means of overhead equipment.



A scene near Mayfair, where new station buildings are to be erected on the steelwork in the background. In the centre, laid on the ground between the tracks, is a welded mast, built up of old rails, for the overhead equipment.

Special steel masts were imported for the first electrification schemes, but vast savings have now been effected by using old rails instead. The rails are welded together by means of steel braces, and all the work was done at a specially erected welding shop at Germiston, the largest railway junction in Africa.

The electric motor coaches are efficient power units, built of steel and resembling the regular suburban coaches, except that portions are taken up by the compartment for the driver and the traction gear. They are equipped with roller bearings. Each motor coach is capable of hauling three trailers, and the normal composition of an electric train is four first, two second and two third class coaches.

The area that eventually will be electrically operated, as far as suburban passenger service is concerned, is about 125 route miles, or about 290 track miles. In order to avoid trouble in case any mishap should occur on an electrified section, the power lines will be "sectioned," so that any part may be isolated if required.

The electrification of the line does not mean a farewell to steam, however. The long-distance passenger and all goods trains will still be steam-operated, and with partial electric working already in operation, it is no rare occurrence to see an electric train speeding along at the side of a steam train on a parallel track.

SETS (Postage Extra)

3	Canada Jubilee ... 4d.	5	Kenya ... ... 3d.
1	Ceylon ,, ... 2d.	5	Kenya, Ugan., Tan. 3d.
3	,, Cor. ... 11d.	1	,, ,, Jub. 3d.
1	Dominica Jub. ... 4d.	3	,, ,, Cor. 1/-
3	,, Cor. ... 9d.	5	Malta ... ... 2d.
1	Grenada Jub. ... 4d.	10	,, ... 5d.
3	,, Cor. ... 9d.	1	,, Jub. ... ... 2d.
2	Gold Coast Jub. ... 8d.	3	,, Cor. ... ... 8d.
3	,, ,, Cor. ... 9d.	10	Fed. Malay States 5d.
5	Hong Kong ... 2d.	5	Nigeria ... ... 3d.
10	,, ,, ... 5d.	10	,, ... 6d.
1	,, ,, Jub. 4d.	1	,, Jub. ... 3d.
3	,, ,, Cor. 1/-	3	,, Cor. ... 10d.
10	India ... ... 2d.	5	Newfoundland ... 2d.
4	,, Jub. ... ... 6d.	10	,, ,, ... 5d.
10	Jamaica ... ... 5d.	1	,, ,, Jub. 3d.
1	,, Jub. ... 2d.	3	,, ,, Cor. 10d.
3	,, Cor. ... 9d.	20	New Zealand ... 6d.

J. RUSSELL,
23, SHANKLIN DRIVE, WESTCLIFF-ON-SEA.

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/-. This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/- each or more. (I do not sell less than 100.) During this month I will include a stamp cat. at least 3/-. Can you find it?
A returnable deposit of £1 is required from overseas applicants.
H. HARDY, "Hoyland." Potter Heigham, Norfolk.

100 DIFFERENT STAMPS FREE to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

130 DIFFERENT STAMPS FREE

This is not a packet of miscellaneous rubbish, but a wonderful offer of long and short sets that will greatly increase the value of your collection. Coronation and mint Colonial stamps, portraits of famous Kings, Queens and Rulers, also Dictators, Jubilee and Air Mail stamps and portraits of Queen Elizabeth and Queen Mary. Finally, a MAGNIFICENT SET OF 25 DIFFERENT BOHEMIA, all absolutely free. Just send 2d. postage, requesting approvals and new 1938 Catalogue and list of further similar gifts.

LISBURN & TOWNSEND LTD. (Dept. M.M.), LIVERPOOL 3

FREE WONDERFUL 1938 OFFER 20 NEW ISSUES AND NOVELTIES

Including **ANDORRA** (new), Belgium, Canada, Denmark, **FRENCH EQUATORIAL AFRICA** (pictorial), **GRENADA (King George VI), GREECE (Bull vaulting scene),** Jugo Slavia, **KELANTAN** (Sultan Ismail), **MOZAMBIQUE CO. (Giraffe), MOROCCO AGENCIES (King George VI, already obsolete),** Turkey, etc. I will send this collection absolutely free to all stamp collectors **sending 2d. postage** (abroad 4d.).

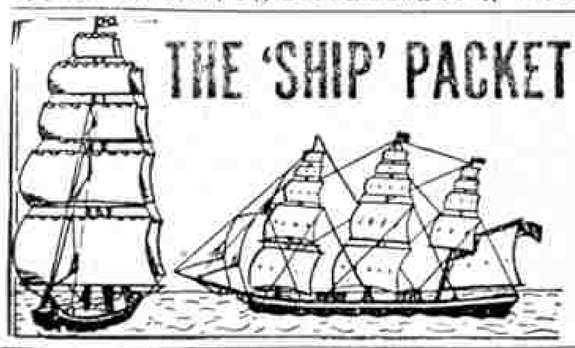
G. P. KEEF, WILLINGDON, EASTBOURNE, ENGLAND.

THE AERO-PICTORIAL PACKET

This super packet containing over 50 Pictorial, Airmail and Colonial Stamps only, all modern issues from **GAMBIA, EGYPT, CEYLON, GOLD COAST, KENYA, TANGANYIKA, MADAGASCAR, SIERRA LEONE,** scarce **EUROPEANS, NORTH & SOUTH AMERICA,** etc., offered absolutely

FREE

to genuine collectors sending 2d. stamp for postage, etc., and requesting selection of **AIRMAIL** and **PICTORIAL STAMPS** on approval. This splendid packet is offered entirely to introduce selections of modern stamps on approval, and if sent without approvals price will be 1/- post free. (Abroad 1/6 with or without approvals.)
C. H. SHAW (DEPT. 1), 95, CHRISTCHURCH AVENUE, KENTON, HARROW, MDDX.



THE 'SHIP' PACKET

This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada, **KOUANG-TCHEOU,** new, **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS,** etc. Price 4½d., postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA, 100 BRITISH COLONIALS 1/-, 20 AIRPOST 6d., 6 TRIANGULARS 7d., 50 PERSIA 4/-, 9 POLAND** New Pictorials 8d., **VOLUMES OF B.O.P. CHEAP.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet,** which contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **1 pkt. 1/6. 3 pkts. 3/9. 5 pkts. 6/-. All post free inland.** Postage to Colonies **3d. per pkt. extra.** S. Africa and Foreign **6d. extra.** Beware of imitations.

O. NERUSH
(DEPT. "A"), 68, TURNPIKE LANE, LONDON, N.8.

JANUARY PACKETS

Each Packet is "All Different."

100	Balkan Countries 1/6	50	Q. Victoria Heads 1/6
200	Austria 1/6	500	Br. Col. & Fgn. 1/8
50	Air Stamps ... 1/9	15	Triangular Stamps 2/-
50	K. Edward Heads 2/-	100	Portuguese Cols. 2/-
20	Triangular Stamps 2/6	50	Bird Stamps ... 2/6
100	K. George Heads 2/6	20	Used Coronation 1/10
100	Zoological Stamps 3/8	100	West Indies ... 3/8
30	Sil. Jub., U. & Un. 3/9	1000	Br. Col. & Fgn. 3/9
50	Belgian Colonies 3/9	70	Spanish & Italian (Comm. & Air only) 3/9
100	Animal Stamps ... 5/-		
200	Portuguese Cols. 5/3	150	K. George Heads 5/10
300	British Empire ... 6/-	25	Mint Br. Pacific Is. 2/6
33	Mint Br. Africans 2/3	40	Mint Br. Asiatic 2/6
100	Indian Native St. 3/4	30	Br. Col. War Stps. 3/9
100	Architectural Stps. 4/6	200	Scandinavia ... 2/-
30	Malay Native St. 2/6	200	French Colonies 3/-

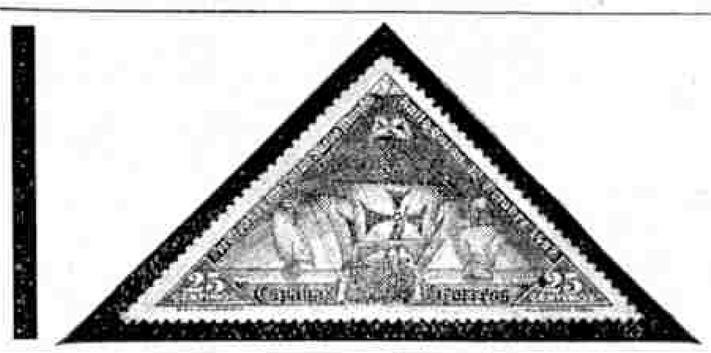
Cash with Order. Postage Extra.

EDWARD SANDELL,
10, Evelyn Grove, Southall, Mddx.

ONE-SIXTH CATALOGUE!

No catch—but really thousands different at above rate in my attractive approval sendings. Large stock of all Colonial and Foreign countries.
CAMPBELL, HALDON AVENUE, TEIGNMOUTH, DEVON.

FREE! EXHIBITION PACKET containing 50 different stamps, including **ANTWERP 1894** and **BRUSSELS 1896 EXHIBITIONS,** etc., 250 mounts, duplicate book, and perforation gauge. Request approvals. Enclose 2d. postage. No approvals sent abroad. A. R. Dickie (Dept. M), 23, Winscombe Crescent, Ealing, W.5.



TRIANGULAR PACKET

This rare and beautiful stamp was issued by Spain to commemorate the explorer Columbus, and shows his Flagship, *Santa Maria*. We are presenting it **FREE,** together with **10 other fine Spanish issues, including General Franco stamps,** to all readers requesting approvals, and including 2d. postage. (Without approvals, price is **9d.**)

MICHAEL HERBERT
(M), 88, EDINBURGH ROAD, WALTHAMSTOW, LONDON.

FREE 25 COLONIAL AND FOREIGN PICTORIALS CAT. 10/-

THIS MARVELLOUS PACKET, VALUED AT 2/6, is offered as the **GREATEST** New Year's gift to applicants for my well-known "Value" approvals.
JUBILEE AND CORONATION issues, **PICTORIAL INDIAN NATIVE STATES, SCARCE HIGH VALUE,** mint **AMERICAN** issues and beautiful **PICTORIALS AND COMMEMORATIVES** (mint and used) are included. **YOU** will be **DELIGHTED AND SURPRISED** at the **VALUE OF THIS GIFT.**
To the **FIRST 20 APPLICANTS** I'll also give a **SCARCE SPANISH CIVIL WAR STAMP.**
SENT POST FREE BY RETURN.
PHILIP COCKRILL, 13, MONTRELL ROAD, STREATHAM HILL, LONDON, S.W.2.

NEW YEAR'S OFFERS

START THE NEW YEAR WELL. Send for my Approval Selections—these contain Mint and Used Jubilees, Coronations, Comms., and Colonial New Issues. **The Most Interesting Ranges—The Keenest Prices. Used Coronation Sets.** Caymans, Falklands, Kenya, Nyasaland, **9d. each.** Niue (on F.D.C.) at **1s. 6d. Mint Sets. N.Z., Niue** or **Cooks, 1s. 3d.; Morocco, 6d.**
FREE Set of **6 Greece, 1937** Pictorials (with Venus de Milo) to all purchasers of 2s. 6d. from above, or to genuine approval applicants enclosing 2d. post.
T. R. Hughes (P.T.S.), 'Ibis Cottage,' Amersham, Bucks.

MINT CORONATIONS—YOUR LAST CHANCE

Aden 1/-	Br. Solom'ns 1/3	Hong Kong 11d.
Antigua ... 8d.	Cayman Is. 6d.	Jamaica ... 8d.
Ascension 9d.	Ceylon ...11d.	Malta... ... 7d.
Bahamas ... 7d.	Cook Is. ... 1/6	Mauritius ... 1/-
Barbados ... 8d.	Cyprus ...10d.	Newf'ndl'd 8d.
Basutoland 9d.	Falklands ... 6d.	N. Zealand 1/4
Bechuanal'd 9d.	Fiji ... ...10d.	Nauru... ... 2/3
Bermuda ... 8d.	Gibraltar ... 8d.	Nyasaland 6d.
Br. Guiana 9d.	Gold Coast 9d.	Niue 1/6
Br. Hond'ras 9d.	Cash with Order—Postage Extra.	

H. L. GOMM, 41, Upper Cranbrook Road, BRISTOL, 6.

THE FIRST STAMP Ever Issued

(British 1840 Penny Black) for P.O. **3/6.** It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further **5/9** (cat. 17/6)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/-) for **12/6;** 4d. blue (cat. 15/-) for **5/-;** and 6d. pale lilac (cat. 40/-) at **15/-.** Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**
NORRIS & CO. (Dept. M), Norwood, London, S.E.19.

GENUINE BARGAIN

75 Different Foreign and Colonial Stamps selected from Collections presented to Hospital. Send 6d. and addressed envelope (unstamped) to:
SECRETARY,
Memorial Hospital Hall, Woolwich, LONDON, S.E.18.

FREE CORONATION PACKET to all genuine applicants for my approvals sending 2d. postage. A. Brock, 26, High Road, Potters Bar, Middlesex.

APPROVALS

My approvals are worth writing for, apart from the free gift, largely consisting as they do of modern pictorial and commemorative stamps, mostly in sets although priced separately. You should know, too, particulars of my extra free gift plan.

EGYPT AIR MAILS

Fine set of four Egypt Air Mails, used, showing Imperial Airways machine flying over the Pyramids—an interesting combination of old and new—sent free to all genuine applicants for approvals enclosing 2d. postage. Mention M.M.

THREEPENNY SETS

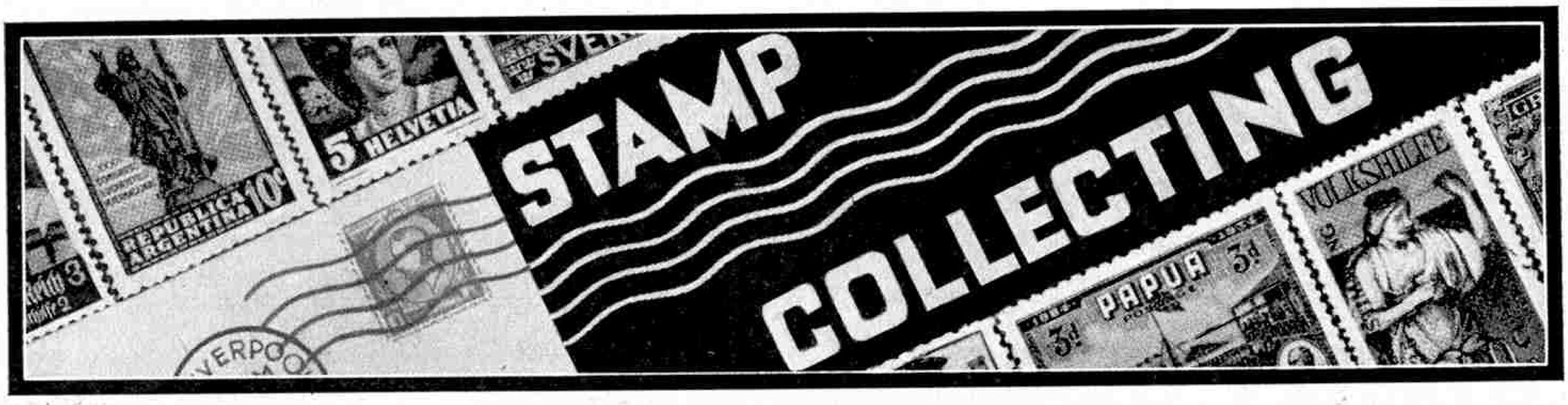
4 Kenya 1935. 4 Siam, ex-King. 5 Canada 1935. 4 Canada 1937, including Coronation. 4 Mozambique 1937 pictorials, unused. 6 Greece 1937 pictorials, unused. 3 U.S.A. Army. 3 U.S.A. Navy. 2 Roumania 1936 Air. All at 3d. each. The lot for 2/-. Postage extra.

50 FRENCH COLONIALS. 9d.

R. D. HARRISON - ROYDON - WARE

KENYA CORONATION SET. USED. 1s. 3d.

See pages 60, xxii and xxiv for other Stamp Advertisements



THE STAMPS OF CHINA

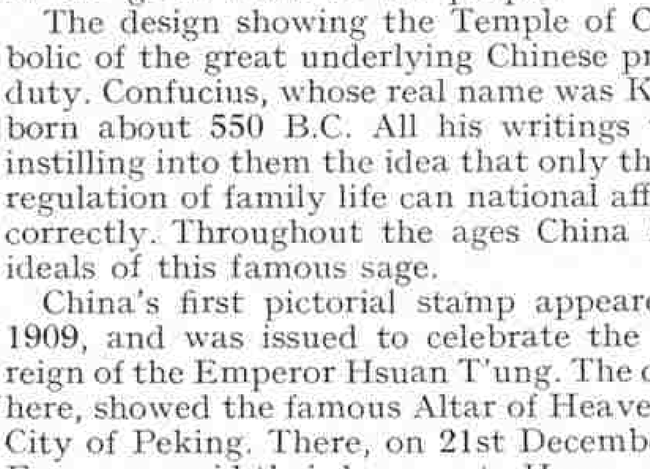
THE war in the Far East between China and Japan naturally has had the effect of directing the attention of stamp collectors to the stamps of China. As we write, there comes the news that Japan has taken over control of the postal and telegraph services in Shanghai, a step that may be followed by the issue of provisional stamps.

The Chinese Postal Service began in 1896, although stamps had been issued by the Customs Department for some 18 years previously. The designs of the early stamps featured the dragon, the symbol of Imperial power, almost exclusively. Other symbolic features, a carp and a wild goose, were used on the high values of the 1897 and 1898 issues, but the general issue of 1913 is more interesting, for its three simple designs give attractive glimpses of the national life of the country.

These designs show a sailing junk on the low values, a rice cutter on the medium values, and a view of the Temple of Confucius at Peking on the high values. All the subjects are typically Chinese. No country makes so much use of small boats as China, and trading junks are the commonest feature of the Chinese rivers and waterssides. Rice naturally is featured, as it is the staple food of the great mass of the people.

The design showing the Temple of Confucius is symbolic of the great underlying Chinese principle of family duty. Confucius, whose real name was K'ung Fu-tsu, was born about 550 B.C. All his writings were directed to instilling into them the idea that only through the proper regulation of family life can national affairs be organised correctly. Throughout the ages China has clung to the ideals of this famous sage.

China's first pictorial stamp appeared in September 1909, and was issued to celebrate the first year of the reign of the Emperor Hsuan T'ung. The design, illustrated here, showed the famous Altar of Heaven in the Imperial City of Peking. There, on 21st December each year, the Emperors paid their homage to Heaven in a ceremony of great ritual and pomp. The form of the altar is unusual. It consists of a triple circular terrace, 210 ft. in width at the base, 150 ft. in the middle and 90 ft. at the top. The platform of the highest terrace is laid with nine concentric circles of marble, the inner circle consisting of nine stones cut to fit closely around the central stone which in turn is a perfect circle. There the Emperors knelt, seemingly in the very centre of the Universe, surrounded by first the nine circles of the pavement, symbolising nine heavens, then the circles of the terraces and the enclosing walls, and finally, beyond them the greater circle of the horizon itself.



The national reverence for this historic temple is revealed when it is pointed out that although its principal significance was the idea that the Universe revolved around the Emperors of China, the Altar was featured on the stamp series issued in 1923 to commemorate the New Constitution adopted by the Republic.

The revolution that deposed the Manchu dynasty in 1911, and converted China into a Republic, was commemorated by a full series of 12 stamps issued in November 1912. Each stamp bears a portrait of Dr. Sun Yat Sen, who organised the revolution and was provisional President of the Republic. Later he resigned in favour of Yuan Shi Kai, whose election brought all the Northern Chinese States into the Republic. A portrait of Yuan Shi Kai appears on a series of commemorative stamps issued late in 1912.

Subsequently Sun Yat Sen and Yuan Shi Kai disagreed on questions of policy. Sun Yat Sen fled to Japan, and from there organised the revolts that took place in 1912 and 1915. Following these the Southern States separated from the North, and Sun Yat Sen became President of the Southern States. He was defeated in the civil war that followed, and resigned the Presidency, but in 1912 he regained it and finally established himself at Canton in 1923. He died in 1925, and the elaborate tomb at Nanking in which he was buried is seen on the four stamps of a series that appeared in 1929.

The struggle for supremacy continued, but step by step the Southern States gained the upper hand, and in June 1928 General Chiang Kai-Shek, Commander-in-Chief of the Southern forces, captured Peking and became President of the Republic. This event and the unification of the country was commemorated by the issue of stamps bearing the portrait of that commander. A specimen of the stamp is illustrated on this page.

The Great Wall of China was built more than 2,000 years ago and is nearly 1,500 miles long. Square forts were built at intervals of half a mile, and the curtain walls between vary from 20 to 30 ft. in height and from 15 to 20 ft. in thickness! Two excellent views of the Wall and its forts appear on the 1921 and 1932 air stamps, and the second of these stamps is illustrated on this page.

In October, 1936, the 40th anniversary of the establishment of the Chinese Post Office was commemorated by the issue of four special stamps. One of these, the 100c., showing the buildings of the Ministry of Communications at Nanking, the capital city, is illustrated at the head of this page. The design of the lowest value of the series, the 2c., illustrated the improvement of mail carrying services during the 40 years. Its centre vignette showed an aeroplane flying above a camel train, with views of a modern liner on one side and of an old sail and steam boat on the other. The 5c. stamp showed a scene off the Bund (waterfront) at Shanghai, and the 25c. a view of the G.P.O. buildings at Shanghai. The 2c. and 5c. stamps in this series are orange and green respectively. The 25c. value is blue, and the 100c. is red.

There is an interesting field in the stamps of China for the collector who is interested in building up historical records with stamps, and fortunately the compilation of such a collection would not be expensive.

STAMP COLLECTORS!

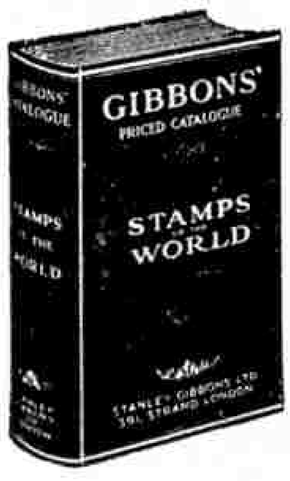
THIS IS THE SEASON OF GIFTS—
GET THE BEST, AND THEREFORE
GET YOUR STAMP GIFTS FROM

STANLEY GIBBONS

TO HELP YOU CHOOSE WHAT YOU WANT, WRITE TO-DAY FOR OUR TWO **FREE** LISTS

104 pages giving full details of all Stanley Gibbons' Stamp Albums, Catalogues, Books and Accessories, and particulars of hundreds of fine Stamp Bargains.

Three Gift Suggestions:



GIBBONS' PRICED CATALOGUE, 1938

Best and most detailed catalogue—essential to every keen collector who wishes to keep right up-to-date with his collecting. 1,868 pages, and 2,049 new issues added with 25,191 price alterations in this new edition. Price **16s.**

Postage extra, U.K. 6d., abroad 1/3

STANLEY GIBBONS' SIMPLIFIED CATALOGUE, 1938

Wonderful catalogue listing all the world's stamps in simpler form. 1,085 pages with 7,301 full-size illustrations for only **5s.**

Postage extra, U.K. 6d., abroad, 1/1

CORONATION STAMPS

Get these historic stamps from us **now,** at our remarkably cheap prices.

CROWN COLONIES (Complete)	**27/6**
DOMINIONS (Complete)	**40/-**
Representative Set of 45 Crown Colonies' stamps	**5/-**

Above prices are "post free" for the two Complete sets; add 2d. for postage on the Representative Set. The stamps all became obsolete at the end of 1937 and above prices must be quoted subject to alteration without notice, but if you order **now** you will get them as cheaply as possible.

STANLEY GIBBONS LTD.

Dept. S.15, 391, STRAND, LONDON, W.C.2

IMPROVED

THE "MYSTIC" PACKET

1000 UNKNOWN UNUSUAL UNSORTED 1/6

(over 200 diff. guaranteed.)

Stamps on paper, etc., just as received from Convents, Missions, Banks, etc. Guaranteed unpicked. Chance of a **FIND** in every lot. Send to-day for your treasure hunt to-morrow. 3 for **4/3,** 6 for **8/-.** Abroad, extra postage. **FREE!** 25 Br. Cols., including **CORONATIONS,** to Approval applicants. Also **FREE EXCHANGE.** Enclose ptge. Overseas **3d.** Dealers Supplied.

ASTLEY & CO. (M.2), NEWBOLDS, WOLVERHAMPTON

— 1937 —

This magnificent **FREE** collection contains 1937 stamps ONLY and includes Triangulars, Air Mail, Postage Due, Coronation, Commem., War, Provisional and Pictorial emissions. In it you will find **SPAIN** (Civil War Issue); **GREECE** (Red Cross); **HUNGARY** (International Fair); **CHINA** (Sun Yat Sen ovpd.); **TRENGGANU** (Postage Due); **LIBERIA** (Triangular—Allied Hornbill); **ROUMANIA** (Air Mail); **GREECE** (Bull Fight); **AUSTRALIA** (Coronation—George VI); **ANDORRA** (Arms); **BULGARIA** (Fruit and Vegetables); **KOUANG-TCHEOU** (Native Boat); **FR. EQUATORIAL AFRICA** (Logging); **BELGIUM** (State Seal); **CANADA** (George VI) and **GREAT LEBANON** (Cedar of Lebanon) among others. It's great, and will be sent you absolutely **FREE** by sending us 2d. stamps and requesting one of our famous 'Grey' booklets of stamps on approval. Usual price without approvals is **3/6.**

WINDSOR STAMP CO. (Dept. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

JOIN IN

Every month hundreds of M.M. subscribers send for our FREE PACKETS OF STAMPS; if YOU have not already sent you should do so at once, and join the ever-growing list of satisfied readers. THIS MONTH we are GIVING ENTIRELY FREE a wonderful packet of 108 STAMPS, EVERY ONE DIFFERENT, every one Genuine and every one of which you will be proud to own. Included are NEW ISSUES, AIR STAMPS (Special pair of ROUMANIA, Flying Hotel), Large MULTI-COLOURED COLONIAL PICTORIALS and a whole lot more REALLY GOOD STAMPS. This packet is a small COLLECTION IN ITSELF. To secure this WONDERFUL GIFT just request our World Famous Approvals, enclose 2d. postage (abroad 6d.) and leave the rest to us.

N. Moseley (Dept. M.A.5), Central Market, Cardiff.

ALL BRITISH COLONIAL APPROVALS

Fine **BRITISH AFRICAN PACKET** including scarce **GAMBIA** set, **KENYA COLONY, MAURITIUS, TANGANYIKA,** etc. **FREE** to collectors sending 2d. stamp for postage, etc., and requesting selection of **ALL BRITISH COLONIAL STAMPS** on approval. **BRITISH COLONIALS** only on approval at bargain prices, including **JUBILEE, CORONATION** and **PICTORIAL ISSUES** from West Indies, Africa, Cyprus, Gibraltar, Iraq, Palestine, Papua, etc. (No stamps sent Abroad.)

C. H. SHAW

(Dept. M.1), 95, Christchurch Av., Kenton, Harrow, Mddx.

FREE THE WONDER PACKET. Ask for my approval sheets and new lists and enclose 1½d. postage and I will send you the following packet absolutely **FREE—50 FINE STAMPS** including new **IVORY COAST,** a handsome stamp, two **CORONATION COLONIALS, BRAZIL** airpost (curious looking stamp), **GREEK,** Red Cross, **DENMARK (SILVER JUBILEE),** 2 new **POLISH** Pictorials (fine), **2 NEW ZEALAND** (Zoological Pictorials, new), **PALESTINE,** etc. **STAMP BARGAINS.** 10 Persia 3d., 10 Peru 4d., 100 different British Colonials 1/-, 6 Triangular 7d., 1,000 different 3/11, 45 Coronation (one from each Crown Colony) 5/-, 20 Brazil 10d. My new large list of 700 Bargains, post free 1½d. Send addresses of stamp-collecting friends and receive 6 Venezuela or 3 Ichang.

H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET.

FIRST STAMPS OF EIRE

New Irish Constitution Commemoratives. This handsome issue promises to be the most popular set of the New Year.

Complete mint set 2d. and 3d. Price **6d.** Postage extra.

FIRST DAY COVERS. Historic First Day cover franked with the 2d. Constitution stamp, and bearing the special cancellation (in use for one day only). Price **10d.** Complete set on Registered First Day Cover. Price **1/3.** Price list free. Commemoratives used on orders.

CHARLES F. BOURKE (M.M.), ELMVILLE, FERRYBANK, WATERFORD, IRELAND.

FREE New issue packet of 25, including set of 5 New Greece Classic issue of Nov. 1937, perforation gauge and watermark detector. Also, to every tenth boy applying, a Free Brit. Col., cat. 5/- in addition to the above. All you have to do is to send for my splendid **ALL PICTORIAL** approvals at ½d. and 1d. each. Every stamp a picture stamp.

COURT, 76, WILLOWDALE ROAD, LIVERPOOL, 9.

BURMA PACKET FREE!

Here is a truly astounding packet, which no one should miss, containing **2 Gwalior** (officials), **Australia** (Victoria Centenary), **Italy** (Mussolini), **Perak** (Sultan Iskandar), **Trinidad** (First Boca) and **BURMA** (already obsolescent—after being in issue only a few months), and a host of other interesting items. Just send 2d. in stamps, and request a Green approval book from:

G. KINGSMILL (Member D.W.E.C., S.T.P.A.), Dept. MM, NEW BARNET, HERTS.

CYPRUS, BARBADOS, GRENADA,

Andorra (provisional), Hong Kong, Jamaica, Niger, Coronation and Silver Jubilee, Palestine, and 50 different others, all post free for 3d. and in addition, all buyers of this packet who **ASK TO SEE MY APPROVAL SHEETS** receive a **SET OF FOUR SENEGAL** (Pictorial) **FREE.** Ask for my new approval sheets. Great variety. Good discount. Write to-day and get a selection. Exchange desired with all Colonies and Dominions. **F. G. ROWE, 69, Edgehill Road, Bournemouth.**

HYDERABAD PICTORIAL PACKET FREE!

Do not miss this fine offer of 25 stamps all different. In addition to 5 handsome Pictorials from Hyderabad, there is a Pictorial issue from Guatemala; several scarce old Spanish stamps; a 2½d. stamp of King Edward VIII; an old Queen Victorian stamp, etc., etc. All **FREE** to applicants for approvals enclosing 2d. postage.

R. WILKINSON, 18, ST. PETER'S ROAD, CROYDON.

See pages 58, xxii, and xxiv for other Stamp Advertisements

Stamp Gossip

and Notes on New Issues

Austrian Railway Centenary

The centenary of railway operation in Austria, which occurred on 13th November, has been celebrated by the issue of three most attractive stamps, each of which is illustrated on this page.

The prime movers in the laying down of the first Austrian railway were Franz Riepl and Friedrich Liszt, whose interest had been aroused by George Stephenson's successful experiments in England with the "*Rocket.*" Riepl succeeded in gaining the Emperor's consent to the building of a line from Vienna to Bochnia, a distance of 280 miles, and an official opening ceremony was arranged as soon as the first stretch of track, an eight-mile length from Floridsdorf to Deutsch-Wagram, was completed. The inaugural run was made on 23rd November, 1837, the journey from Floridsdorf to Wagram occupying 26 minutes. After 15 minutes rest, the return journey was made, both runs passing off without a hitch. Regular public traffic commenced on 6th January, 1838, on the completion of a wooden bridge over the Danube.

The locomotive used on the historic run was the "*Austria,*" and this engine is shown on the 12 gr. commemorative stamp. It was built in England by Robert Stephenson and Company, and was driven by an English driver, who was attired in a frook coat, top hat and white gloves, and was greatly admired by the crowds who had gathered to witness the event.

The 25 gr. stamp illustrates the latest steam locomotive practice in Austria, the engine shown being one of a 2–8–4 class that is now used on the heavy express trains running between Vienna and Salzburg. They are capable of speeds approaching 100 m.p.h., even with extremely heavy loads to haul.

Electricity is playing an increasingly important part in the working of the Austrian Federal Railways, and today 16 per cent. of the route mileage is operated by electric locomotives. That shown on the 35 gr. stamp is representative of a new series recently introduced for use on a section electrified in 1935.

New Irish Commemoration Stamps

The coming into force of Ireland's new Constitution on 29th December was celebrated by the issue of two special commemorative stamps, 2d. and 3d. values, coloured in ruby and blue respectively, which are to remain on sale until 31st May.

In the design, which is illustrated here by courtesy of the Minister of Posts and Telegraphs, Ireland is personified by a girl who is shown sitting by the side of a lectern on which rests an open book. In her right hand, which is resting on a harp, symbol of Gaelic culture, she is holding a quill pen with which she has just inscribed in the book the opening words of the new Constitution. The English translation of these words is "In the Name of the Most Holy Trinity." In the new constitution these opening words run on to acknowledge the supreme dominion of God and to invoke His divine assistance for the country.

The arms of the four provinces of Ireland are incorporated across the base of the lectern, to signify that the Constitution has been framed for a united Ireland.

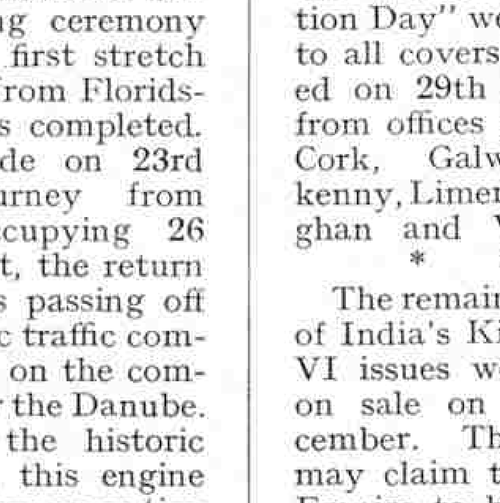
Special first day cancellations bearing the words "Constitution Day" were applied to all covers despatched on 29th December from offices at Dublin, Cork, Galway, Kilkenny, Limerick, Monaghan and Waterford.

* * *

The remaining values of India's King George VI issues were placed on sale on 15th December. Thus India may claim to be the first country in the Empire to have a complete King George VI series on sale.

Peruvian Air Congress Issue

Peru marked the holding of the 1937 Pan-American Air Congress at Lima in September by issuing a series of four commemorative stamps. We illustrate the 1 sol value, showing a map of the American continent on which are shown air routes with which the Peruvian services are linked.



Of the other designs, that on the 10c. value shows Juan Bielovucic, the first Peruvian airman, flying over Lima. Jorge Chavez, the outstanding pioneer of Peruvian aviation is seen on the 15c. stamp, an interesting point of this stamp is that Chavez is shown wearing a cap. Can any of our readers recall this form of headgear appearing previously in a stamp design? The 25c. stamp gives an excellent view of the Limatambo Airport.

Greek Art Series

The illustration in this column shows one of the stamps of the new Greek general series that was briefly described in our notes last month. This is the 20l. design, showing "*Jupiter the Destroyer,*" the illustration being based upon a famous bronze statue of the period 730–500 B.C. The 25l. stamp shows the famous painting "*Glory*" by N. Ghysis, that was inspired by a poem written by Solomis, upon the occasion of the disaster of Psara during the Greek War of Independence in 1830. A portrait of Solomis, it is interesting to note, appeared on the 15 dr. value of the Greek 1930 issue commemorating the Centenary of Independence.

Austrian Winter Charity Issue

The designs of Austria's 1937 winter relief fund issues continue the custom of recent years of reproducing portraits of eminent men of the past. This year nine of Austria's famous physicians are honoured, the portraits being as follows: 5+5 gr., Gerhard van Swieten (1700-1772); 8+8 gr., Leopold Auenbrugger (1772-1809); 12+12 gr., Karl von Rokitansky (1804-1878); 20+20 gr., Joseph Skoda (1805-1881); 24+24 gr., Ferdinand Ritter von Hebra (1816-1880); 30+30 gr., Ferdinand Ritter von Arlt; 40+40 gr., Joseph Hyrtl (1810-1894); 60+60 gr., Theodore Billroth (1824-1894); 64+64 gr., Theodore Meynart (1833-1892). This interesting series now includes musicians (1922), writers (1931), painters (1932), architects (1934), military and naval heroes (1935), inventors (1936), in addition to this year's series.

Stamp Profits to Build School

It has often been claimed that stamp collecting is a useful part of a boy's education, but rarely is there available such concrete evidence of philately's value to education authorities as is afforded by the decision of the Barbados Government to devote the profit on the sale of Coronation stamps, amounting to £1,000, to the building of a new school.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

Diver Employees of the L.M.S.

Among the 230,000 employees of the L.M.S. Railway are 30 men who spend practically the whole of their working time under water. These unusual railwaymen are employed as divers, chiefly at the company's docks, and for other work at the lakes (where the company operate steamer services), canals, and the foundations of railway bridges.

While their work at the docks is largely occupied in making periodic underwater inspections in order that the vessels can obtain speedy clearance, there are occasions when the divers are required for special jobs. One of the biggest recent tasks undertaken by L.M.S. divers was in connection with the erection of a new slipway at Lakeside for use by the steamers plying on Lake Windermere. This, in its early stage, necessitated considerable diving work. While the underwater work has now been completed, workmen are still busy getting the remainder of the construction work finished so that the vessels may be hauled out of the water and reconditioned for next season.

In addition to their normal duties, these railwaymen divers are occasionally called upon by local authorities in connection with the laying of underwater cables, gas and water mains, and reservoir work. When new boats are launched, too, they are employed by the builders to "sweep away" the timbers from underneath the vessels. One L.M.S. diver, working single-handed, recovered 15 wagon loads of timber displaced during a launching ceremony.

Many exciting experiences have befallen these railway divers. Foreman Diver Douglas, of Barrow-in-Furness, had a narrow escape from drowning when working in a diving bell on the renewal of gate floor roller paths at Barrow docks. He had given orders for the bell to be lowered to begin work, but instead of taking four minutes to reach a depth of 30 ft., it took only as many seconds. "It seemed," Diver Douglas said afterwards, "as if our ear-drums were going to burst! I did not worry so long as air was available, but I was anxious for my 21-year old mate. It was about half-an-hour before we were hauled up. I then discovered that the clutch of the crane had given out, and this resulted in the brake being unable to hold the weight of the bell. The lifting gear had to be transferred to a hand-winch to pull up the bell. Had we gone another two feet to the east we should have struck the gate sill, been jerked over, and drowned!"

Traffic Lights in Piccadilly Circus—

(Continued from page 11)

to the inlet traffic streams. Should an inlet volume decrease to any extent, "right-of-way" is transferred as quickly as possible to the outlet stream, thus taking advantage of the momentary "breathing space" to clear the Circus. A message is sent at the same time to the master timer, so that the maximum cycle length can be adjusted accordingly.

The gyratory movement round the fountain in the centre of the Circus itself is retained, and the scheme allows a sequence of five traffic movements in accordance with signal changes. The order of the sequence is generally constant, but each movement is not necessarily in operation for the same length of time.

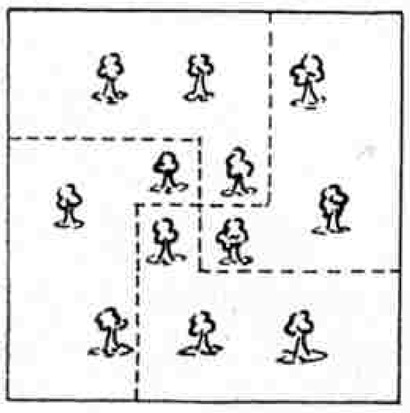
For the information given in this article we are indebted to Automatic Telephone and Electric Co. Ltd.

Answers to December Puzzles

No. 1. Farmer Giles divided the field as shown in Fig. 1.

No. 2. Pour A into C; pour C into B. The respective quantities in A, B and C will then be 4 pints, 5 pints and 1 pint.

Fig. 1



No. 3. No. The second boy won, for he held his breath for one interval longer than the first boy.

No. 4. There is too much space between "are" and "and," and "and" and "and," and "and" and "but."

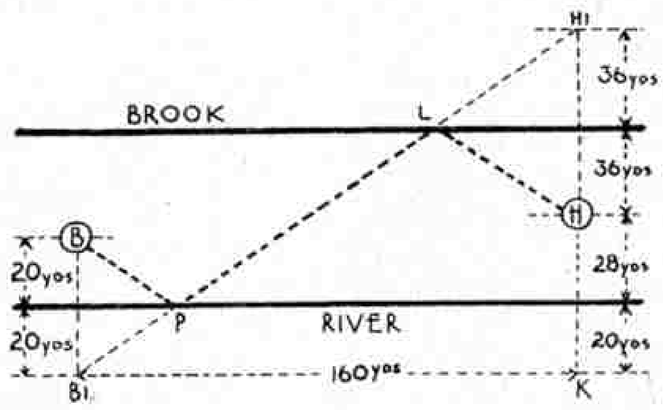


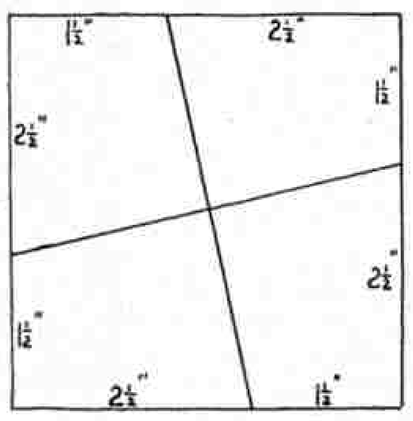
Fig. 2

No. 5. The ten coins are a halfpenny, two pennies, threepenny piece, a sixpence, a shilling, two florins and two half-crowns.

No. 6. The shortest route is BPLH in Fig. 2. It is 200 yds. long.

No. 7. "A misunderstanding between friends."

Fig. 3



No. 8. Fig. 3 shows the arrangement of the pieces of cardboard.

No. 9. The solution is shown in Fig. 4.

No. 10. CLAY, CLAD, GLAD, GOAD, GOLD, HUM, HIM, AIM, AIR.

No. 11. Both bullets would hit the bandit.

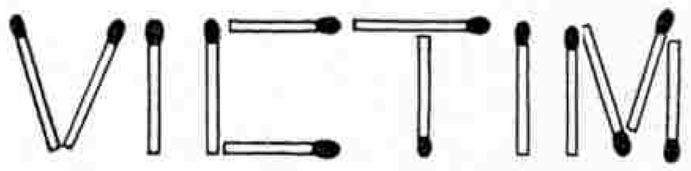


Fig. 4

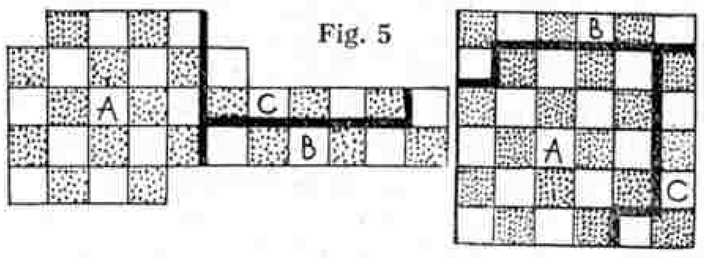
No. 12. Fig. 5 shows how the linoleum was cut out and re-arranged.

No. 13. Jack is 28 and Bill is 21.

No. 14. On Fig. 6 Tommy traversed the lines from the following points: ADG, HEB, CFK, EA.

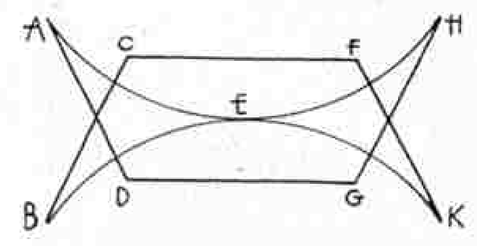
No. 15. The man had one eye; there were two plums on the tree; and he took one.

Fig. 5



No. 16. 1. Macadam. 2. Neither. 3. Decocts. 5. Proceed. 5. Emanate. 6. Incline. 7. Ontario.

Fig. 6



No. 17. The following was the order in which the six crossed the river: One cannibal and one missionary crossed; one missionary returned with boat; two cannibals crossed and one returned; two missionaries crossed; one cannibal and one missionary returned; two missionaries crossed; one cannibal returned, and finally two crossed.

Pocket Cinema for "M.M." Readers

Readers will remember the pocket moving pictures of Sir Malcolm Campbell's successful attack on the world water speed record that were distributed in October last by C. C. Wakefield and Co. Now this firm have produced a new "flicker," showing Capt. George Eyston's "*Thunderbolt*" capturing the world's land speed record at an average speed of 312.0 m.p.h. An actual moving picture of the record run is seen on flicking over the pages of the booklet with the thumb.

Copies of this fascinating souvenir have been reserved for readers of the "*M.M.*," and can be obtained free by writing to C. C. Wakefield and Co., Cheapside, London, E.C.2, mentioning the "Magazine."

The Bingoscope Home Cinema

It is possible nowadays to enjoy cinema shows at home with simple and inexpensive equipment such as the Bingoscope Home Cine Projector. It is produced specially for home shows in four models. Three of these, priced from 5/- to 17/6, are fitted for operating with dry batteries, and the fourth, price 25/-, is suitable for working from D.C. or A.C. electric mains of all voltages. All models are fitted with excellent quality focussing lenses and shutters, and simple film threading device.

An excellent range of non-inflammable films, including "Silly Symphonies," "Mickey Mouse" and "Donald Duck" features, is available for use with the Bingoscope projectors, and thus the problem of what to show is very easily solved. Messrs. L. Rees and Company, 12, New Union Street, London, E.C.2, will be glad to send full details of the Bingoscope projectors and films to any reader who writes mentioning the "*M.M.*"

Diaries for 1938

Most stationers will be able to show our readers the splendid range of diaries produced by Charles Letts and Company. The three that will appeal most to our readers are the "*Schoolboy's*," "*Boy Scout's*" and "*Motor Cyclist's*" Diaries. "*The Schoolboy's Diary*," price 1/-, gives maps of the world, tables, athletic records and notes on careers. It is published in two editions, for preparatory and public schoolboys respectively. The "*Boy Scout's Diary*," price 9d., deals with first aid, map reading, signalling and physical exercises, and scout law and tests, and the "*Motor Cyclist's Diary*," price 1/-, includes distance and gradients tables, and notes on road law in addition to first aid hints.

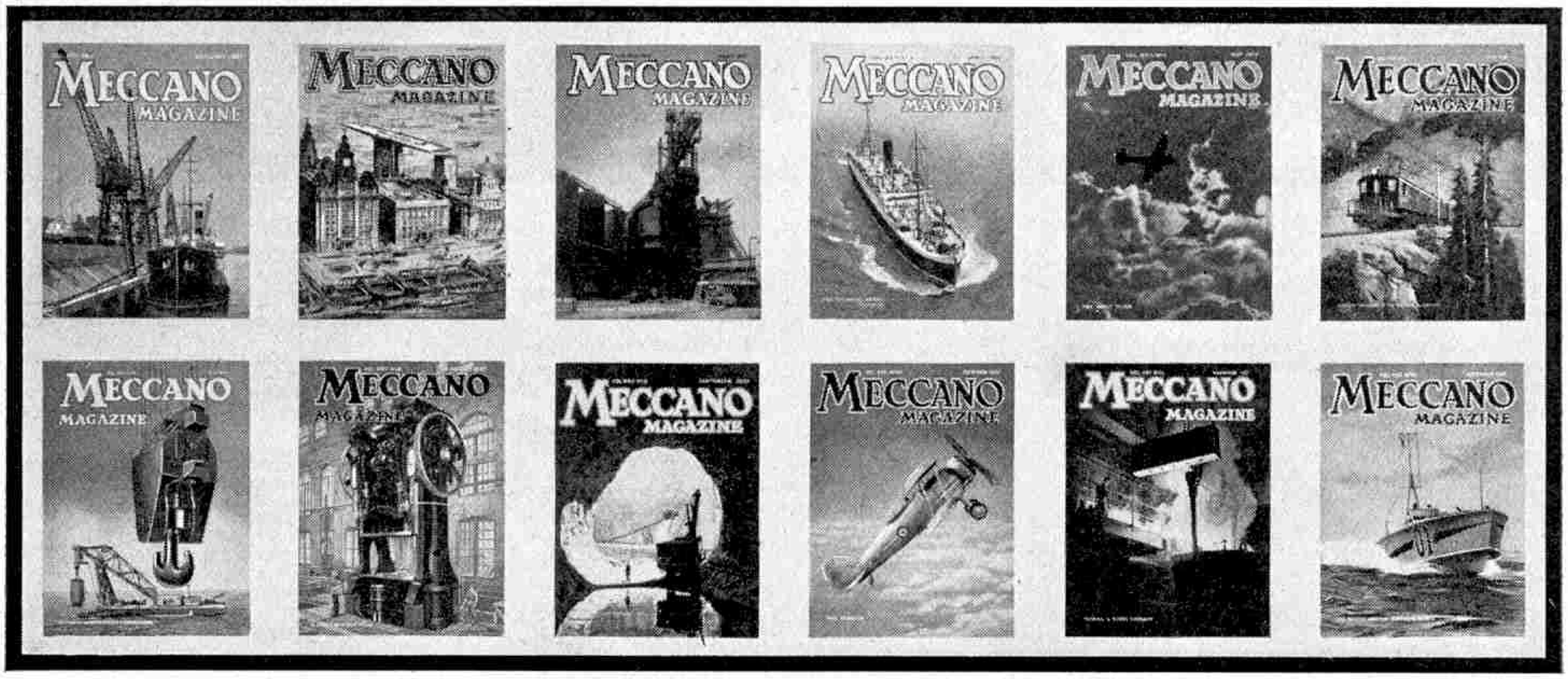
The "Occupational" diaries published by Thomas de la Rue are very attractive. The diary proper is well bound in pliable leather covers, with gilt edged leaves, indexed pages and perforated corners, and sells at 3/-. In addition "Occupational" units are made. Each is priced 6d., and they are to be slipped into position in the diary by means of a loop inside the front cover. They deal with such subjects as athletics, flying, engineering, cricket, model-making, stamp collecting and winter sports, and each is written by an expert.

Gilbert Electric Drills

The A.C. Gilbert Company, 109, Kingsway, London, W.C.2, ask us to announce that, owing to the increase in the cost of raw materials, they were compelled to increase the price of the Gilbert "Junior" Electric Drill from 32/6 to 35/- between the time of preparing their advertisement for the December "*M.M.*" and the date of publication. They feel that this explanation should be given in fairness to the many purchasers of this popular tool, who may have been puzzled by the advertising of the lower price.

An electric drill is indispensable to the up-to-date young handyman, for it will perform dozens of jobs around the house much faster and more accurately than the old fashioned manually-operated breast drill. Our advertisers will be glad to send full details of their "Junior" Electric Drill to any "*M.M.*" reader who is interested.

Competition Corner



WHICH WERE THE MOST POPULAR COVERS IN 1937?

Once again we offer our readers an opportunity of taking part in a Cover Voting Contest. As it is two years since last we featured a contest of this type, we are sure that the competition will prove a popular re-introduction.

In the above illustration the splendid covers that appeared on the various issues of the *"M.M."* during 1937 are reproduced in reduced form in their order of publication—January to June in the upper row, and July to December in the lower. The reproductions are intended for reference purposes only. They convey nothing of the brilliancy of the colour of the originals, but new readers will find them of great assistance in forming their judgment. Those readers who possess copies of the 1937 issues, or are able to obtain them, should make a careful study of the originals before completing their entries.

Referring to each cover by its month of issue, each competitor is asked to state on a postcard:

A. Which of the twelve covers he likes best of all.

B. His idea of the order of popularity of the covers as decided by the massed votes of all the competitors.

This list must cover the whole year, every month being included. The name of the month must be given, and its number in the volume. Competitors need not place their own favourite cover at the head of list B, unless they believe that it will prove to be the popular choice of the remaining competitors. They should place it in the position they think the massed votes will give.

The entrant's name and address must be added to the card, which should be addressed *"Cover Voting Competition*, Meccano Magazine, Binns Road, Liverpool 13." No competitor may submit more than one entry.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors whose lists most accurately forecast the final result. In the event of a tie for any of the prizes, preference will be given to the entry displaying the neatest or most novel presentation. Closing date, 31st January.

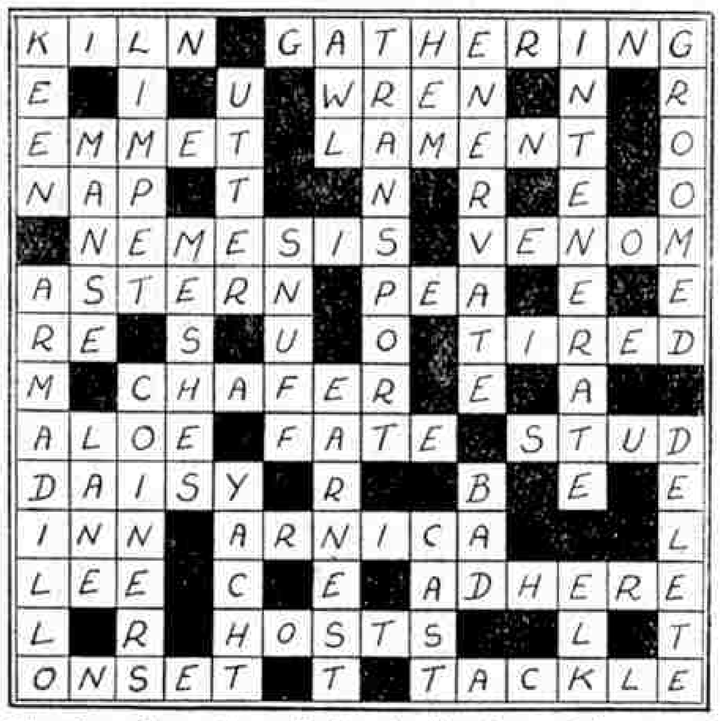
A separate set of prizes, to be awarded in precisely similar conditions, will be awarded in the Overseas Section which is reserved for readers living outside the British Isles and the Channel Islands. The Overseas closing date will be 30th April.

January Drawing Contest

Each month throughout this winter we are offering prizes for the best drawings or paintings submitted during the month. There are no restrictions as to subject or to size. The entries each month are divided into the usual two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products to the value of 21/– and 10/6 will be awarded for the best entries in each section. In each contest a separate set of prizes, to be awarded in similar conditions, is reserved for competitors in the Overseas section.

Entries in the January competition must be addressed *"January Drawing Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st January. Overseas closing date, 30th April.

Unsuccessful entries will be returned if a stamped cover is sent for the purpose.



We give above the solution to the August Crossword Puzzle, the Overseas Section of the competition having now closed.

COMPETITION RESULTS

HOME

November Drawing Contest.—First Prizes: Section A, K. Clark (Alnwick); Section B, A. R. Thompson (Belfast). Second Prizes: Section A, L. P. Deere (Southsea); Section B, J. Laing (Dunstable). Consolation Prizes: F. C. Bent (Disley); P. Dalton (Edinburgh); C. Godden (Ealing, W.5); B. D. Kitt (Ilford); J. Meek (Northolt Park); N. Patton (Sandown, I.O.W.); J. Tyrrell (Walton-on-Thames).

"Hidden Proverbs" Contest.—1. L. V. T. Medlin (Par). 2. W. J. Faulkner (Bristol, 3). 3. H. E. Harrison (Sherwood, Notts.). 4. A. X. Gordon (Welshpool). Consolation Prizes: B. Mitchell (Liverpool 4); T. J. Walker (Sutton).

OVERSEAS

August Photo Contest.—First Prizes: Section A, G. Papa (Naples); Section B, K. Harris (Hong Kong). Second Prizes: Section A, V. Galea (Valletta, Malta); Section B, L. Harland (Johannesburg). Consolation Prizes: J. M. Demanuele (Valletta, Malta); D. R. White (Bangalore, S. India).

August Crossword Puzzle.—1. E. Bunt (Capetown). 2. R. W. Roddick (Rosario de Santa Fe, Argentine). 3. M. Sterling Levis (Sydney). 4. C. Keekok (Singapore). Consolation Prizes: A. Ingall (Moose Jaw, Sask.); K. Jones (Trail, B.C.); V. P. Senji (Madras).

SOMETHING TO CONSIDER

Mr. Howler: "I seldom think of my audience when I'm singing."

Mr. Rapp: "But you ought to have some consideration for them."

* * * *

Pedestrian (during thick fog): "Constable, did you know there was a large unguarded hole in the road, higher up?"

Constable: "Yes, sir."

Pedestrian: "Well, I didn't!"

* * * *

Betty: "How did mamma find out you didn't really take a bath?"

Billy: "I forgot to wet the soap."

* * * *

Jim: "I will give that fellow a piece of my mind the next time I see him."

Bill: "Impossible!"

Jim: "Why?"

Bill: "Only the cleverest scientists can split an atom in pieces."

* * * *

"You look hollow-chested and thin," said the air pump to the inner tube. "What is the matter?"

"Income tacks," replied the inner tube.

* * * *

Visitor: "But surely you can't find much to keep you busy in a little village like this?"

Resident: "Exactly, that's why I came here."

* * * *

Billy had left his watch in his room, and he asked his brother Peter to run upstairs and fetch it.

"It will run down itself if you wait long enough," replied Peter.

* * * *

The youngster pressed the button to stop the tram, then walked down to the other end and again signalled to the driver to stop.

"Why are you ringing the bell at both ends of the tram?" demanded the conductor.

"Because I want both ends to stop while I get out, of course!"

* * * *

Science Master: "What's the formula for water, Jones?"

Jones: "H I J K L M N O,"

Master: "Whatever gave you that idea?"

Jones: "You, sir. You said yesterday it was H to O."

* * * *

Diner: "F.U.N.E.X.?"
Waiter: "S.V.F.X."
Diner: "F.U.N.E.M.?"
Waiter: "S.V.F.M."
Diner: "I'll F.M.N.X. please."
The waiter served the diner with ham and eggs.

* * * *

ALL OUT

Caller: "Can I see the manager, please!"
Office Boy: "He's out."
Caller: "Can I see the Secretary then!"
Office Boy: "He's out."
Caller: "Very well, I'll just wait by the fire."
Office Boy: "You can't. That's out too."

A TICKLISH JOB

"He was kicked out of school for cheating!"

"How?"

"He was caught counting his ribs in a physiology exam."

* * * *

"Yes, sir, I've had my nose broken three times in the same place."

"Well, why don't you keep your nose out of that place?"

* * * *

Little Billy was the centre of a group of admiring men and women. He had crawled out on thin ice to rescue a playmate who had broken through.

"Tell us, my boy, how you were brave enough to risk your life to save your friend," asked one of the ladies.

"I had to," was the answer. "He had my skates on."

* * * *

THE CRITICAL MOMENT

Angus: "Maggie, here's a wee ticket for to-night's conjuring show, and when he comes to that part where he tak's a teaspoonful o' flour and one egg and makes 20 omelettes, watch verra verra close."

* * * *

There was a young boy of Bengal
Who attended a fancy dress ball.
He went just for fun
Dressed up as a bun,
And a dog ate him up in the hall.

* * * *

Master: "Smith, why are you always standing up and looking over Jones's shoulder?"

Smith: "Because he doesn't write plainly, sir."

* * * *

A man was given a job at a siding, running wagons down an incline. There was only a sleeper at the bottom to stop the wagons, and the manager told him to be careful and keep the brakes on.

On the third day four wagons went down at terrific speed, jumped the sleeper, and plunged into the canal.

The manager, anger written all over his face, rushed from his office. The employee, however, forestalled him.

"You needn't come grumblin' at me," he said. "I've left."

* * * *

Sloan: "Did you ever meet a fellow down there with one leg named Sanders?"

Doan: "What was the name of the other leg?"

* * * *

Jimmie wanted an ice cream.

"No," said his mother, "it's too cold for ice cream."

"Well," replied Jimmie, "I could put my coat on."

* * * *

The maid (at the telephone): "Oh, mum, do come home. I've mixed up the terminuses. The wireless is all covered with frost, and the electric refrigerator is singing 'Constantinople'."

* * * *

THIS MONTH'S HOWLER

A refugee keeps order at a football match.

COMRADES IN DISTRESS

Clerk: "I'd like my salary raised next week."

Hard-up Employer: "You'll be lucky if I can raise it this week."

* * * *

"Why does a ticket collector punch a hole in your ticket?"

"So you can pass through."

* * * *

"Why is a dog warmer in summer than winter?"

"In winter he has a coat, in summer he has a coat and pants."

* * * *

"Now, Jack," asked the teacher, "can you give me an example of wasted energy?"

"Yes, miss," came the answer. "Telling a hair-raising story to a bald-headed man."

* * * *

Inquisitive: "Do you think you've boosted your circulation by giving a year's subscription for the biggest potato raised in the country?"

Editor: "Maybe not, but I got four barrels of samples."

* * * *

First Crook: "See that man over there? He made his money out of lead."

Second Crook: "So did I, but I got three years for it."

* * * *

"I can answer any question you like to ask me."

"Is that so! Well, what did the Dead Sea die of?"

* * * *

Graduate: "Professor, I have made some money, and I want to do something for my old college. I don't remember what studies I excelled in, if any."

Professor: "In my classes you slept most of the time."

Graduate: "Fine! I'll endow a dormitory."

* * * *

"What did you do when the judges awarded you first prize in the contest for the healthiest boy in the country?"

"I fainted."

* * * *

Old gentleman (to small coloured boy having trouble in getting away with the large melon he is trying to eat): "Too much melon, isn't it, Rastus?"

Boy: "No boss, not enough niggah."

* * * *

"What's all the noise down there?"

"A motorist turned a corner."

"Well?"

"There wasn't any corner."

* * * *

Teacher: "Now, children, what is a gooseberry?"

Eric: "Please, teacher, a grape with whiskers."

* * * *

NOT WHAT HE MEANT

The chemist had told his assistant to have a new sign painted for the window. When he saw it, he was furious.

"You're a fool," he said. "Who is going to trade here when our sign reads, 'In making up prescriptions we dispense with care!' "

MECCANO AEROPLANE CONSTRUCTOR OUTFITS

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise the different types of machines at a glance. These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

Price List of Aeroplane Outfits

Standard Series

No. OO Outfit	...	...	3'3	No. 1 Outfit	...	...	7'6
No. O Outfit	...	...	4'6	No. 2 Outfit	...	...	12'6

Special Series

No. 1 Special Outfit	...	12'6	No. 2 Special Outfit	...	21'-

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.

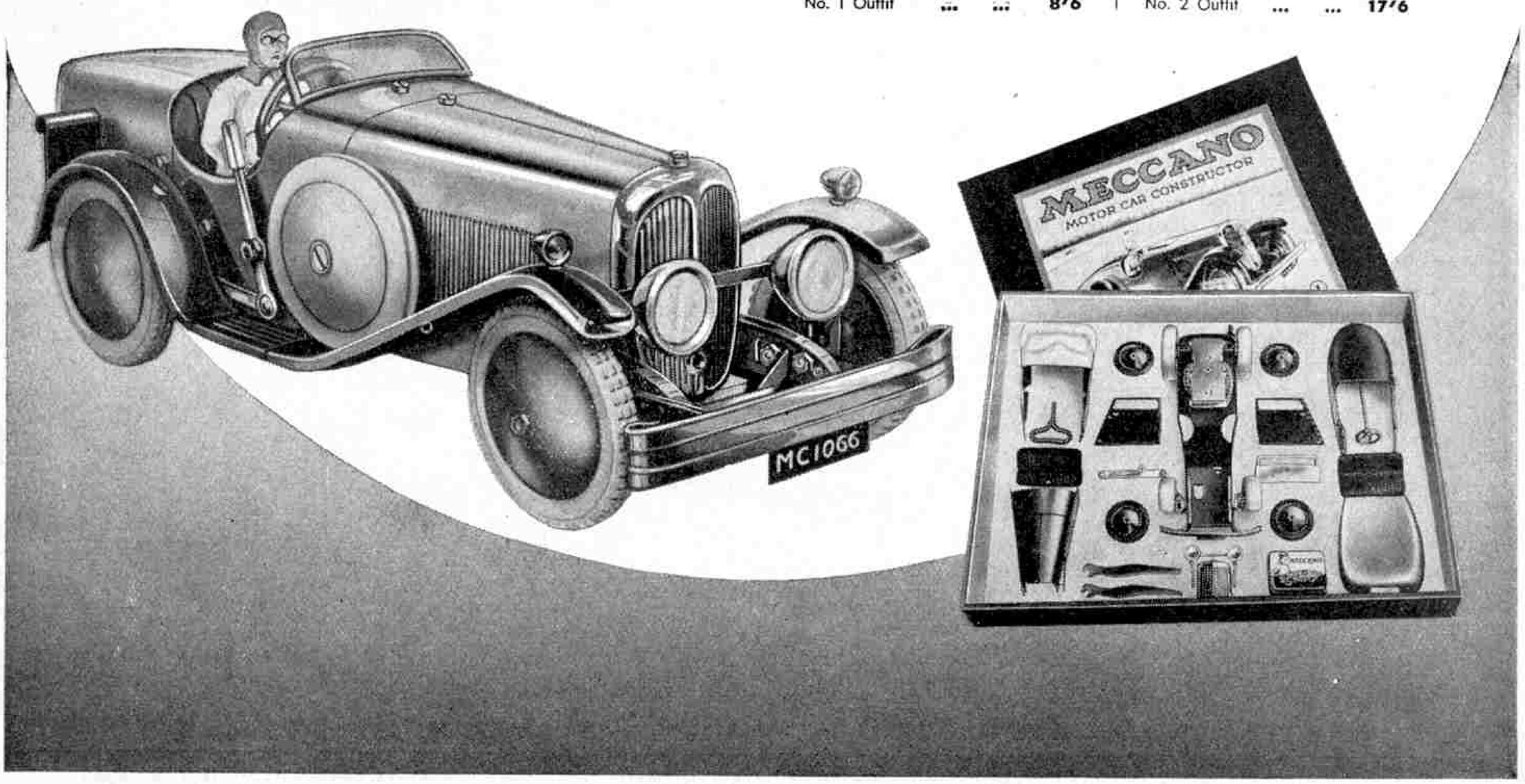
MOTOR CAR CONSTRUCTOR OUTFITS

Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to construct. Your days will be full of fun and thrills!

Perfect miniature reproductions of many different types of car can be built with these splendid Outfits, and a powerful clockwork motor, that gives the models a long run on one winding, is included in each Outfit.

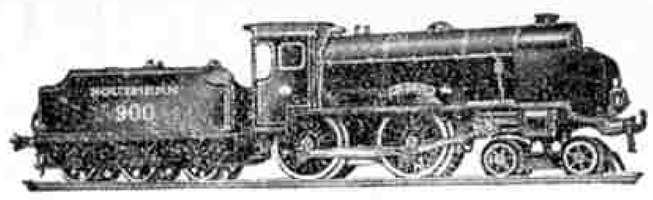
Prices of Motor Car Outfits

No. 1 Outfit	...	...	8'6	No. 2 Outfit	...	...	17'6



MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

PART EXCHANGE SCHEMES IN OPERATION IN CONNECTION WITH MECCANO PRODUCTS



HORNBY TRAINS

New Locomotives for old!

You have probably been using a Hornby Locomotive for some years and would now like to own one of the latest electric or clockwork models featured in our catalogue. The object of the Hornby Locomotive Part Exchange Scheme is to help you to do this.

No matter what the age or condition of your old Locomotive, you can exchange it under our "Part Exchange" plan. It is important to note that we cannot accept more than one old Locomotive in exchange for a new Locomotive.

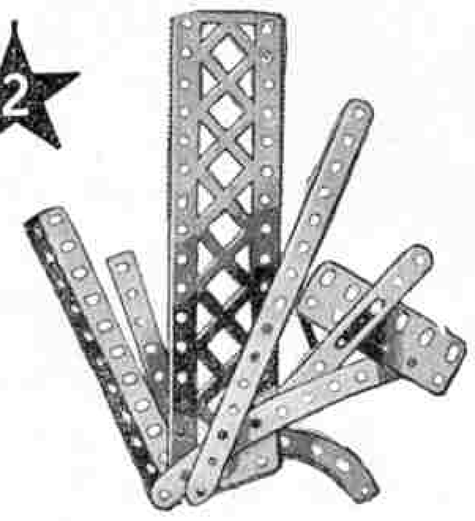
The allowance that will be made for your old Locomotive is shown in a list of Part Exchange allowances for Hornby Locomotives which is obtainable from any Meccano or Hornby Train dealer, or direct from Meccano Ltd. Please note that the catalogue price of the new Hornby Locomotive you purchase *must not be less than double the Part Exchange allowance made for your old Locomotive.*

WHAT YOU HAVE TO DO

Here is an example of how the plan works. Assuming you have a No. 1 Tank Locomotive that you wish to exchange, you see from the list that its exchange value is 5/9. You then look at the Hornby Train catalogue and choose one of the new Locomotives, the cost of which is not less than 11/6 (or, in other words, not less than double the Part Exchange allowance we make for your No. 1 Tank Locomotive).

You decide, say, to have a No. 2 Special Tank Locomotive the price of which is 19/6. Pack up your old No. 1 Tank, take it to your dealer with a remittance for 13/9, and he will exchange it for the new model that you require.

If it is more convenient you can send your old No. 1 Tank to us for exchange. In this case you deduct 5/9 from 19/6 (the price of the new No. 2 Special Tank), and enclose a remittance of 13/9 plus 1/- for carriage on the new locomotive—14/9 in all. The locomotive and remittance should be addressed to Meccano Limited, Special Service Department, Binns Road, Liverpool 13.



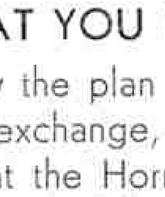
MECCANO PARTS

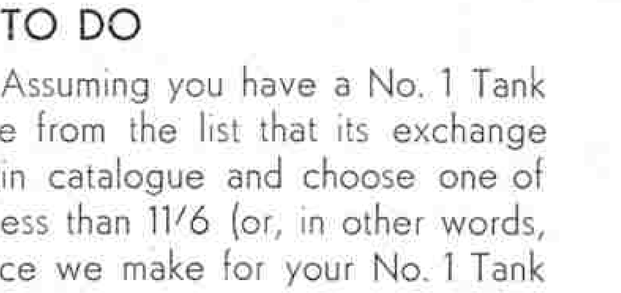
We undertake to exchange any damaged Meccano parts for similar new parts at half the current list price, no matter how old or how much damaged the parts are. Just send them to us, addressed to the Service Department, Meccano Limited, Binns Road, Liverpool 13, together with a remittance covering half the cost of the new parts. The remittance should include postage on the new parts and will be exactly the same as that you pay on the parcel of old parts you send us.

It is very important that you enclose your own name and address written in plain characters.

Parts cannot be taken in exchange for Outfits.

No other part exchanges can be considered





HORNBY TRACK

You can also exchange Clockwork Rails, Points and Crossings for Electric on a piece-for-piece basis, the allowance being half the current price of Clockwork Rails returned. This exchange can be effected through your dealer or direct with us. In the latter event the remittance you send should include sufficient to cover the cost of return postage on the new electric rails, and the amount will be the same as that paid on the clockwork rails you send to us.

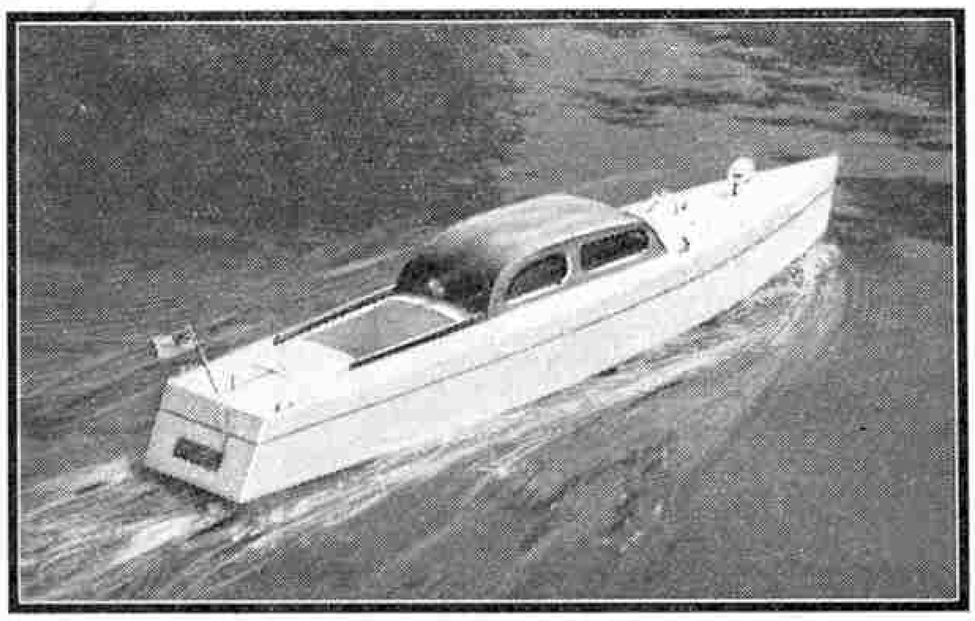
NOTE—The above refers to Hornby Track only, not Level Crossings, Turntables, Viaducts, Buffer Stops and other Hornby Accessories fitted with rails.

"VARIETY IN MODELLING"

"O" GAUGE THRILLS!

Locomotives ready to start at a touch of your finger; goods trains waiting to be shunted; signals ready to prevent disaster to the "up" express—here's a grand new pamphlet to stimulate your interest in the Model Railway! It's yours free. Write for **"RAILWAY THRILLS," F.B. No. 17.** Then wait for the postman's knock. BASSETT-LOWKE railways are better value than ever this year. Less expensive locomotives, goods rolling stock reduced, yet quality maintained throughout. Why not re-lay your outfit with BASSETT-LOWKE steel rail-sheradized, in parts or ready laid. For all details see—

A.17 **Model Railway Catalogue. 6d. post free.**



SHIP AHOY! The 27½" IOLANTHE II at 42/-

Our Model Ship Department offers the most extensive range of true to scale models. We specialise in high-class scale model Liners, Battleships, Racing Yachts, and also less expensive working Motor Boats and Yachts from 1 gn., carrying the BASSETT-LOWKE guarantee of satisfaction. We have sets of parts for would-be model ship constructors from 12/6 and we also make special models for owners and scale model fittings.

S.17 **Our SHIP CATALOGUE is a mine of model shipping information. 6d. post free**

NOVELTY OF "00"

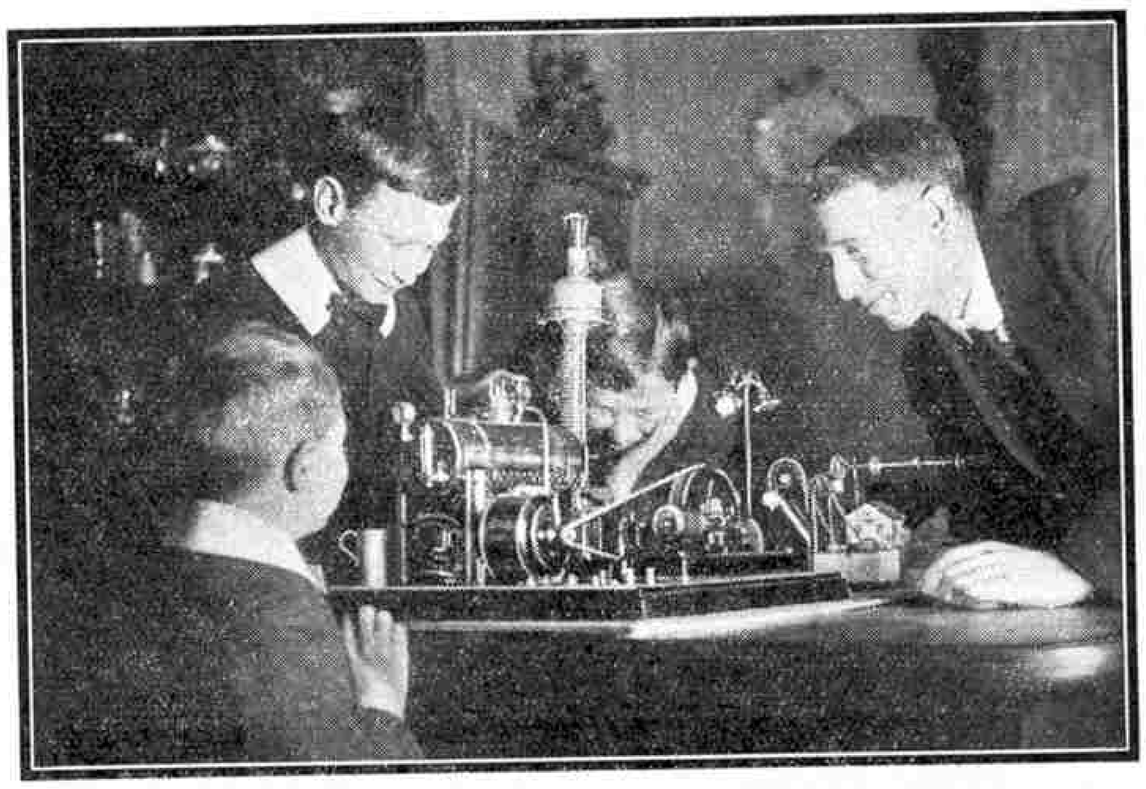
The Twin Trains have been running all over England this Christmas. Thousands of dining tables have been surrounded by amateur engineers fascinated by the panorama of the tiny moving trains.

The smart Passenger Train set consisting of Loco and Tender, 3 Bogie Coaches, Controller, Fittings and Instruction Book costs 37/-. Goods Set 32/- and Suburban Set 28/6. Transformers to suit your mains from 11/6. Track available separately in formations from 14/6.

"Many Ways" Station Buildings to brighten up the layout, made in special interchangeable units of modern design, finished in ferro concrete. Sets from 11/6.

Send today for the Twin Train Catalogue—

T.T.17 **giving full details, pictures and prices of all Twin Train equipment.**



FASCINATING ENGINES

Here is a group looking at a model electric lighting plant, and this we may say can be classed in our category of "other models." You know thirty years of specialisation in model building have justified, we hope, our reputation as some of the finest exponents of the craft in the world.

We make anything from a model water gauge to a working model coal mine. Model builders who take up heavy model engineering work and have their own workshop or tools, will want—

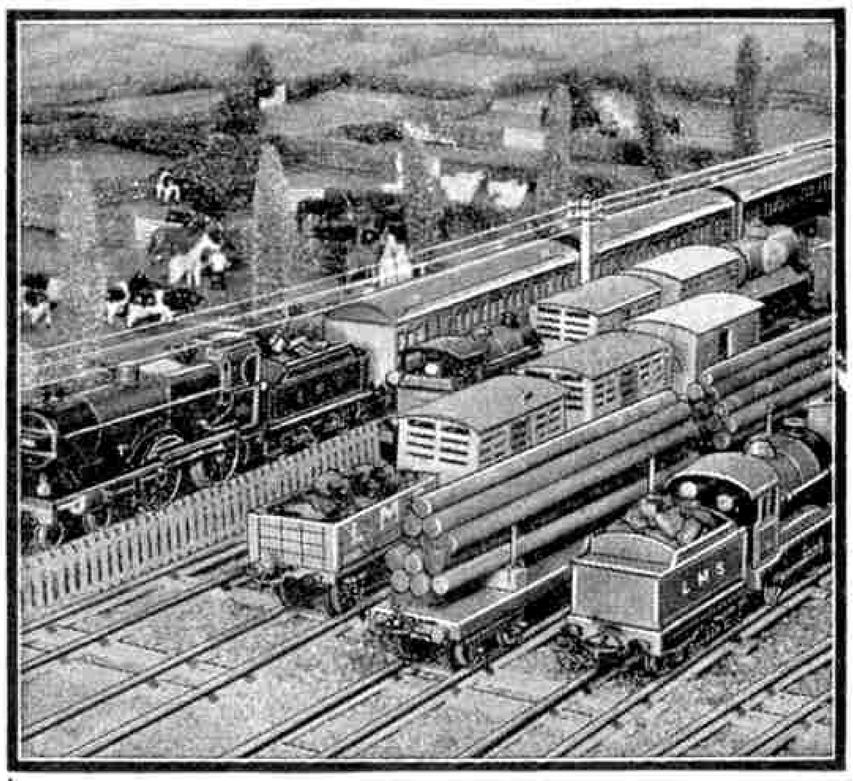
B.17 **our Stationary Engines and Materials List. 6d. post free.**

Start the New Year well. Resolution No. 1—"to get the BASSETT-LOWKE Catalogue that interests me!" We can guess what will follow!

BASSETT-LOWKE LTD., NORTHAMPTON

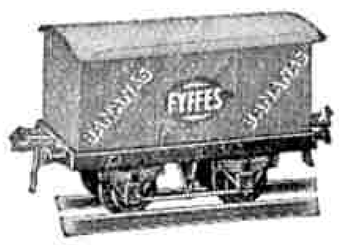
LONDON: 112, High Holborn, W.C.1 | **MANCHESTER:** 28, Corporation Street

HORNBY ROLLING STOCK

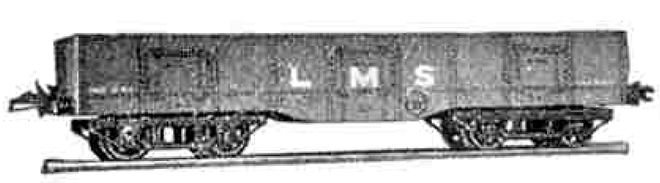


The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished. *
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.

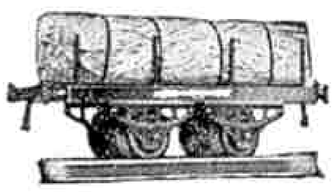
No. 0 BANANA VAN
Lettered L.M.S. only.
Price **1/6**



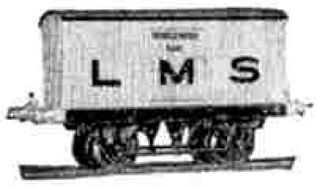
No. 1 BANANA VAN "FYFFES"
Sliding doors.
Price **2/3**



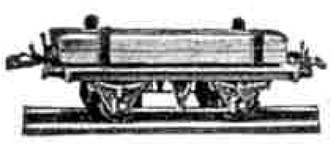
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails. Price **3/9**



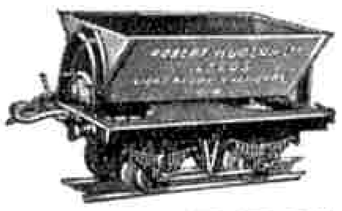
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**



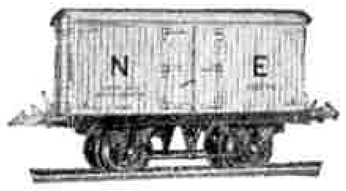
***REFRIGERATOR VAN No. 1**
Finished in white. With sliding doors. Price **2/3**



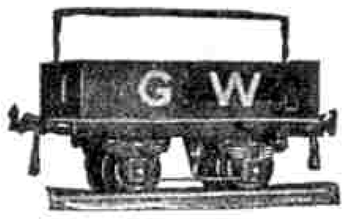
No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/3**



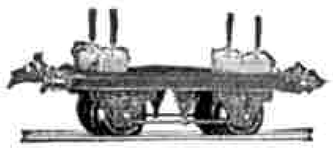
No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **1/9**



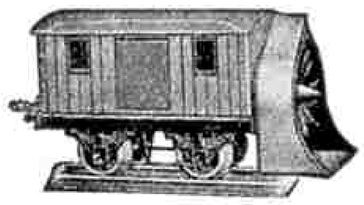
No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E. and S.R. Finished with the appropriate details. Price **1/6**



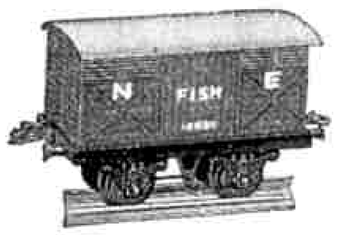
***OPEN WAGON "B"**
Fitted with centre tarpaulin-supporting rail. Price **2/-**



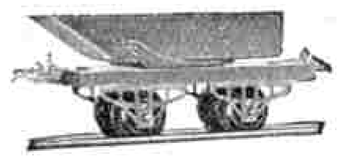
No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **1/3**



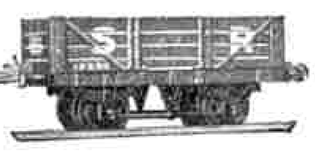
SNOW PLOUGH
With revolving plough. Price **3/6**



No. 0 FISH VAN
Lettered L.M.S., G.W. and N.E. Price **1/6**



No. 0 ROTARY TIPPING WAGON
Container revolves and tips. Price **1/6**

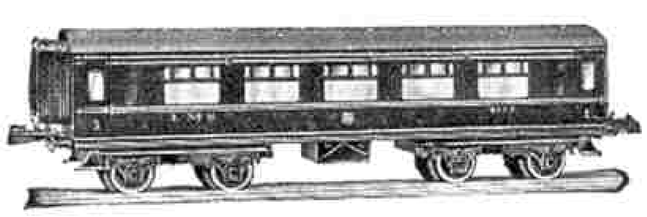


***No. 1 WAGON**
Price **1/6**

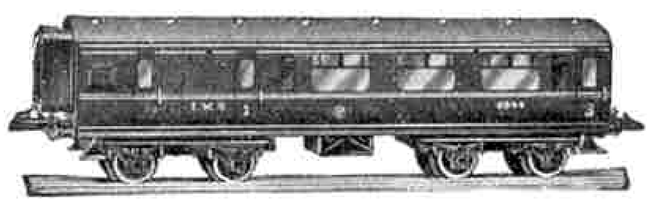
***HOPPER WAGON**
Mechanically unloaded. Price **2/9**

GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/6**

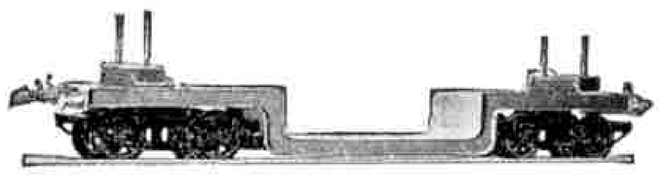
CEMENT WAGON
The door at the top opens. Finished in yellow. Lettered "Blue Circle" Portland Cement. Price **1/11**



No. 2 CORRIDOR COACH
L.M.S. First-third. Not suitable for 1 ft. radius rails. Price **7/6**

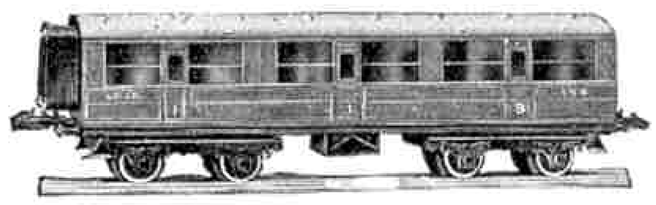


No. 2 CORRIDOR COACH
L.M.S. Brake-composite. Not suitable for 1 ft. radius rails. Price **7/6**

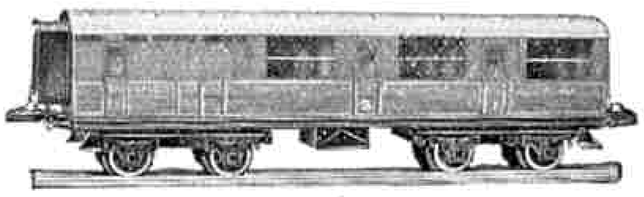


TROLLEY WAGON
Not suitable for 1 ft. radius rails. Price **3/9**

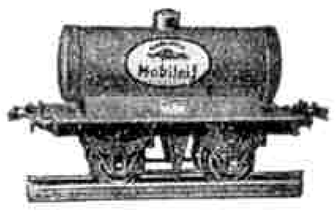
TROLLEY WAGON
Fitted with two Cable Drums. Price **4/3**



No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1 ft. radius rails. Price **7/6**

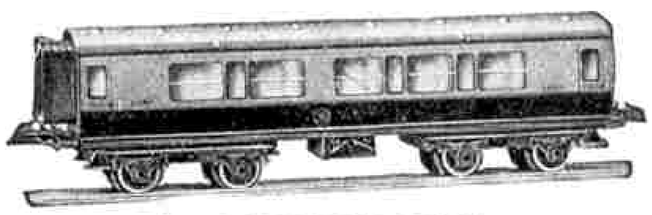


No. 2 CORRIDOR COACH
L.N.E.R. Brake-composite. Not suitable for 1 ft. radius rails. Price **7/6**

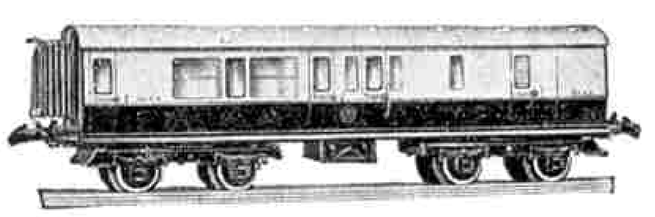


OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **1/11**

No. 1 PETROL TANK WAGON, "SHELL-B.P."
Price **1/11**



No. 2 CORRIDOR COACH
G.W. First-third. Not suitable for 1 ft. radius rails. Price **7/6**



No. 2 CORRIDOR COACH
G.W. Brake-composite. Not suitable for 1 ft. radius rails. Price **7/6**

No. 0 MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only. Price **1/6**

CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof. Price **2/3**

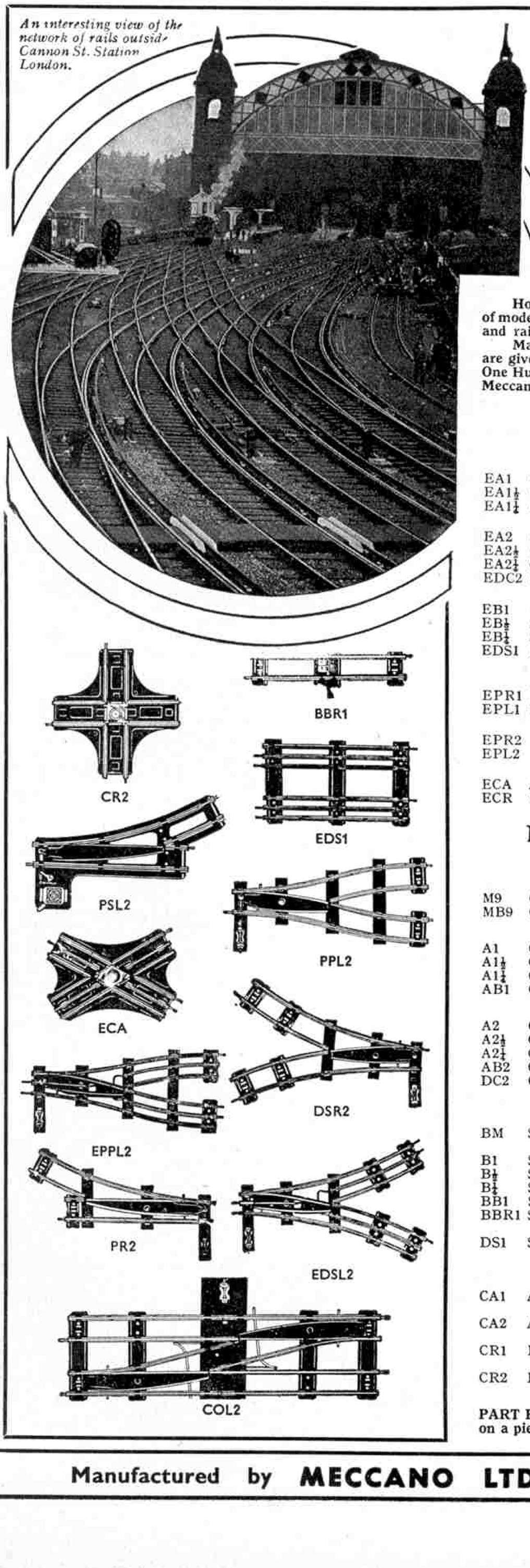
No. 2 CORRIDOR COACH
S.R. Third-class. Not suitable for 1 ft. radius rails. Price **7/6**

No. 2 CORRIDOR COACH
S.R. Brake-composite. Not suitable for 1 ft. radius rails. Price **7/6**

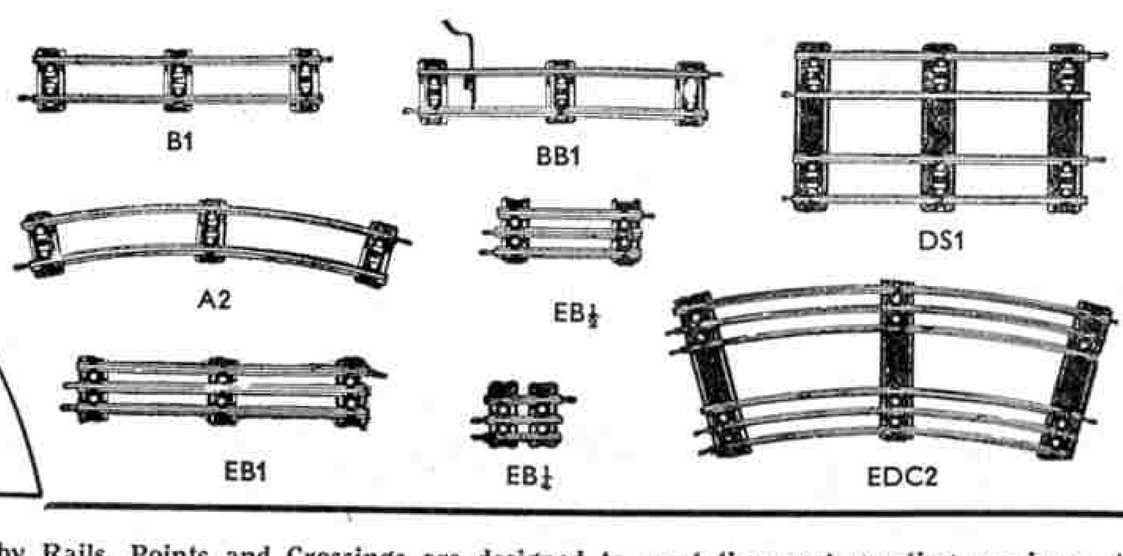
Lettered L.M.S., N.E., G.W. or S.R.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

Hornby Rails, Points and Crossings



An interesting view of the network of rails outside Cannon St. Station London.



Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. They make it possible to construct an almost endless variety of attractive and railwaylike layouts, for both Electric and Clockwork trains.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from any dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved Rails ...	... per doz.	5/-
EA1½	Curved half rails ...	„	4/6
EA1¼	Curved quarter rails ...	„	4/-

2-ft. Radius

EA2	Curved rails ...	... per doz.	5/-
EA2½	Curved half rails ...	„	4/6
EA2¼	Curved quarter rails ...	„	4/-
EDC2	Curved rails, double track, ½ doz.		9/-

STRAIGHT RAILS

EB1	Straight rails ...	... per doz.	5/-
EB½	Straight half rails ...	„	4/6
EB¼	Straight quarter rails ...	„	4/-
EDS1	Straight rails, double track, ½ doz.		8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points }	... per pair	5/9
EPL1	Left-hand points }		

For 2-ft. Radius Curves

EPR2	Right-hand points }	... per pair	7/6
EPL2	Left-hand points }		

CROSSINGS

ECA	Acute-angle crossings ...	each	2/6
ECR	Right-angle crossings ...	„	2/6

DOUBLE SYMMETRICAL POINTS

1-ft. Radius

EDSR1	Double symmetrical points, right-hand }	... per pair	6/-
EDSL1	Double symmetrical points, left-hand }		

2-ft. Radius

EDSR2	Double symmetrical points, right-hand }	... per pair	7/-
EDSL2	Double symmetrical points, left-hand }		

PARALLEL POINTS

EPPR2	Parallel points, right-hand }	per pair	
EPPL2	Parallel points, left-hand }		7/-

CROSSOVER POINTS

ECOR2	Crossover points, right-hand }	per pair	
ECOL2	Crossover points, left-hand }		24/-
EMC20	Switch rails (20-volt) ...	each	1/3
EMC6	Switch rails (6-volt) ...	„	1/3
TCP20	Terminal Connecting Plates (20-volt)	„	1/-
TCP6	Terminal Connecting Plates (6-volt)	„	1/-

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

9-in. Radius (for MO Trains)

M9	Curved rails ...	... per doz.	2/6
MB9	Curved brake rails ...	each	3d.

1-ft. Radius

A1	Curved rails ...	... per doz.	3/6
A1½	Curved half rails ...	„	3/-
A1¼	Curved quarter rails ...	„	2/6
AB1	Curved brake rails ...	each	4d.

2-ft. Radius

A2	Curved rails ...	... per doz.	3/6
A2½	Curved half-rails ...	„	3/-
A2¼	Curved quarter rails ...	„	2/6
AB2	Curved brake rails ...	each	5d.
DC2	Curved rails, double track, ½ doz.		6/-

STRAIGHT RAILS

BM	Straight rails (for MO Trains),	per doz.	2/6
B1	Straight rails	„	3/6
B½	Straight half rails ...	„	3/-
B¼	Straight quarter rails ...	„	2/6
BB1	Straight brake rails ...	each	4d.
BBR1	Straight brake and reverse rails,	each	1/3
DS1	Straight rails, double track, ½ doz.		5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	1/9
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„	1/6
CR1	Right-angle crossings (for 1-ft. radius tracks)	„	1/9
CR2	Right-angle crossings (for 2-ft. radius tracks)	„	1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points }	... per pair	3/-
ML9	Left-hand points }		

1-ft. Radius

PR1	Right-hand points }	... per pair	3/-
PL1	Left-hand points }		

2-ft. Radius

PR2	Right-hand points }	... per pair	3/-
PL2	Left-hand points }		
PSR2	Points on solid base, right-hand ... ... }	per pair	8/6
PSL2	Points on solid base, left-hand ... ... }		

(Fitted for Hornby Control)

SPSR2	Points on solid base, right-hand }	per pair	5/-
SPSL2	Points on solid base, left-hand }		

These points are similar to Points PSR2 and PSL2 but they are not fitted with ground disc or for Hornby Control.

PARALLEL POINTS

PPR2	Parallel points, right-hand }	per pair	3/6
PPL2	Parallel points, left-hand }		

The above Parallel Points can be used with either 1 ft. or 2 ft. radius track.

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1 Double symmetrical points, right-hand
DSL1 Double symmetrical points, left-hand
per pair 3/6

For 2-ft. Radius Curves

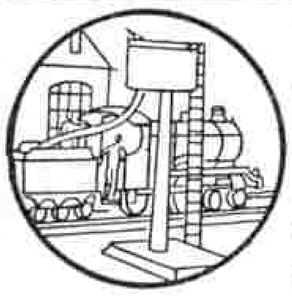
DSR2 Double symmetrical points, right-hand
DSL2 Double symmetrical points, left-hand
per pair 3/6

CROSSOVER POINTS

COR2	Crossover points, right-hand }	per pair	
COL2	Crossover points, left-hand }		12/-
RCP	Rail Connecting Plates ...	½ doz.	2d.

PART EXCHANGE. You can exchange Hornby Clockwork Rails, Points and Crossings for Electric on a piece-for-piece basis, the allowance being half the current price of Clockwork Rails returned.

Manufactured by MECCANO LTD., BINNS ROAD, LIVERPOOL 13

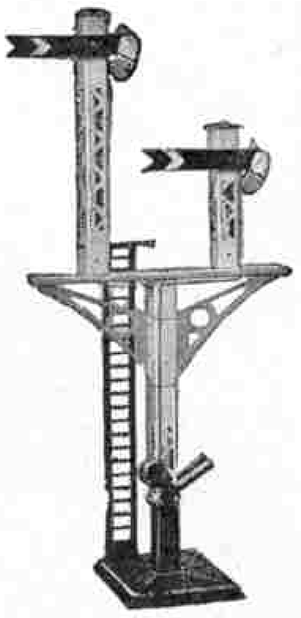


HORNBY ACCESSORIES

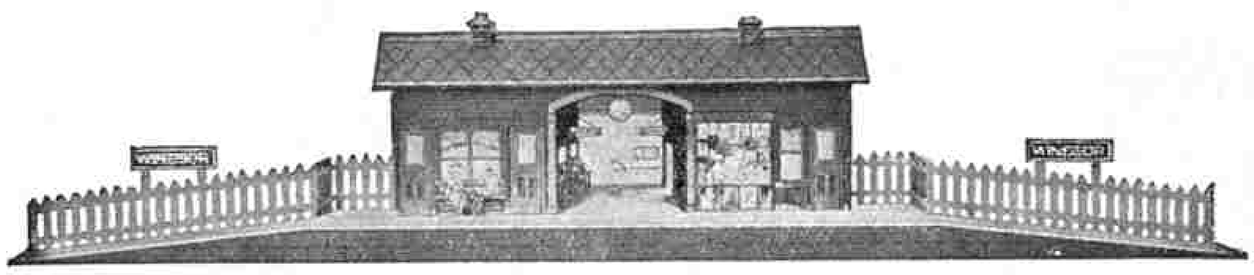
There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.

No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price **2/3**



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price **4/6**



No. 2 STATION
Built up with three detachable sections. Named "Margate," "Wembley," "Ripon," or "Reading." Length 2 ft. 9 in., breadth 6 in., height 7 in. ... ... Price **8/–**

No. 2E STATION
This Station is fitted for electric lighting, otherwise it is the same as No. 2 Station, illustrated above. Price **9/3**

No. 4 STATION
Similar to No. 2 Station for dimensions and style but of an improved design, more strikingly coloured, and with accessible Booking Hall and Ticket Office Barrier ... ... Price **9/–**

No. 4E STATION
This Station is fitted for electric lighting, otherwise it is the same as No. 4 Station ... ... Price **10/3**

No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price **3/11**

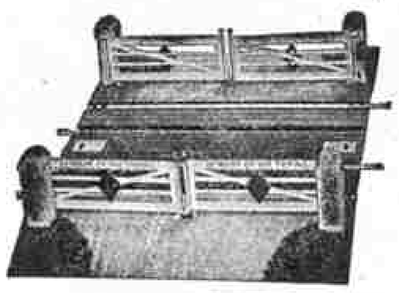
No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever.
Price **2/6**

TELEGRAPH POLES
Price per pair **3/–**

No. 2 WATER TANK
Height 9 in.
Fitted with flexible tube and valve lever.
Price **5/9**

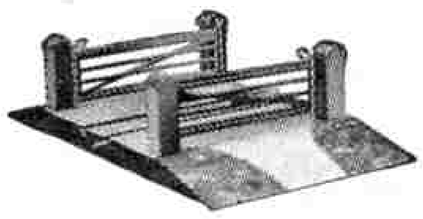
GRAPHITE GREASE
For Springs.
Price per tube **6d.**

MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair **3d.**



No. 2 LEVEL CROSSING
Measures 13½ x 10¼ in., with two tracks of gauge O rails in position.
Price **4/11**

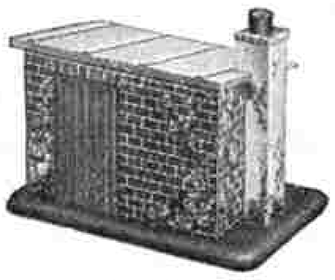
No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks.
Price **6/11**



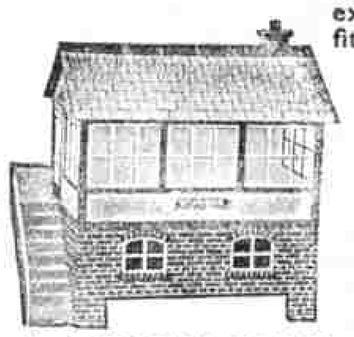
No. 1 LEVEL CROSSING
Suitable for a single track only.
Price **2/11**

No. E1 LEVEL CROSSING (Electrical)
Similar to No. 1 Level Crossing, but fitted with electrical track.
Price **3/9**

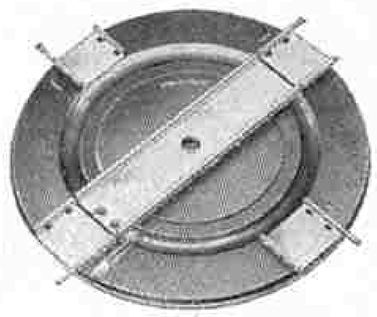
No. 1 SIGNAL CABIN
Finished in colours.
Price **2/6**



PLATELAYER'S HUT
Price **1/–**

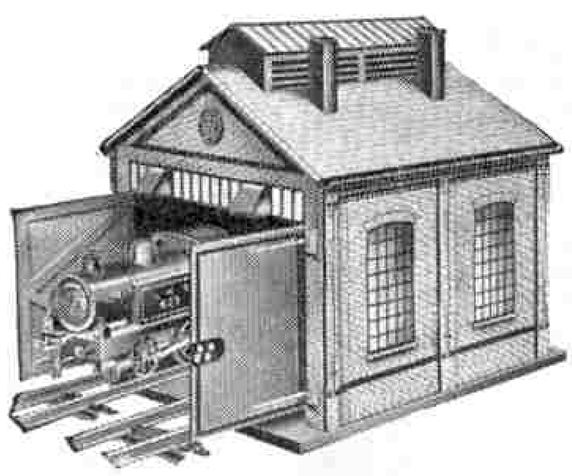


No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price **3/6**

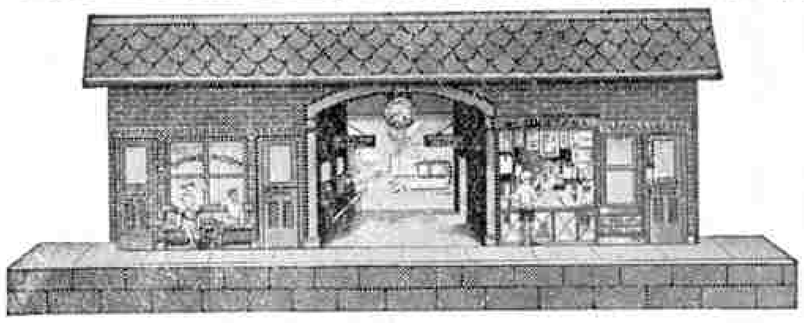


No. 1 TURNTABLE
Price **1/11**

VIADUCT Price **5/11** **VIADUCT (Electrical)** Price **7/6**
VIADUCT Centre Section only ... ... Price **4/–**
VIADUCT (Electrical) Centre Section only ... Price **4/6**

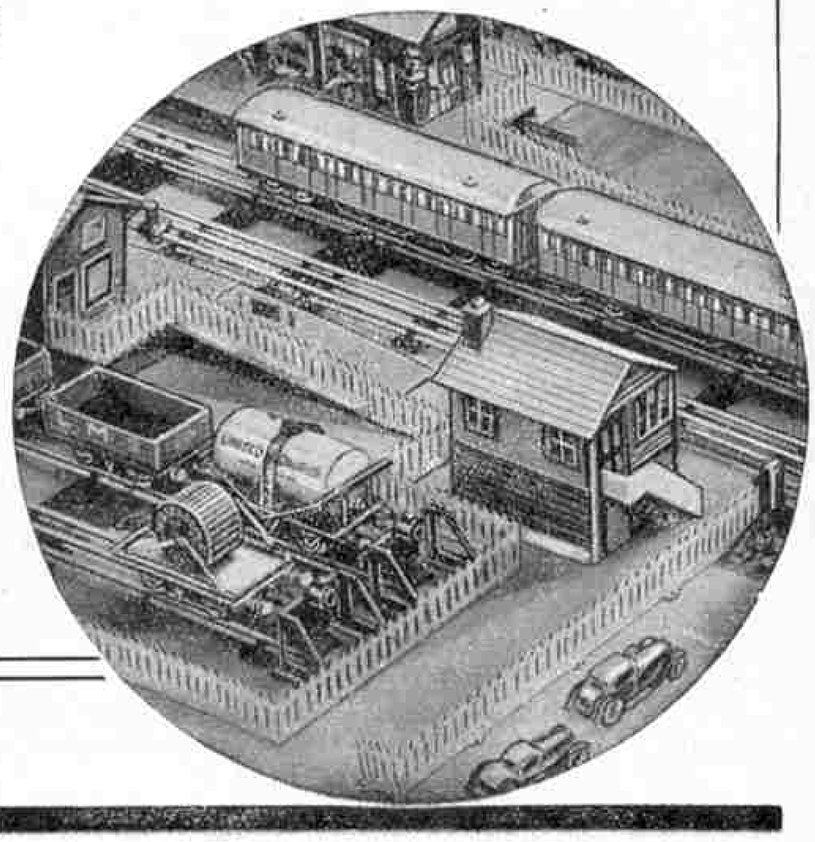


No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **13/9**



No. 1 STATION
Length 16¾ in., width 6 in., height 6 in. ... ... Price **4/6**

No. 3 STATION
Similar to No. 1 Station for dimensions and style, but of an improved design, more strikingly coloured. Price **5/6**



MECCANO LTD., LIVERPOOL 13

H A R B U T T ' S

Plasticine

will add realism to your Meccano models...

Next time you build with Meccano, try the effect of some lifelike touches with "Plasticine." You will be surprised at the improvement—and it will add much fun and enjoyment to your hobby. "Plasticine" is made in 16 attractive colours and there are many fascinating outfits such as these:

DESIGNER, 5′6 and 12′6, *post free 6′1 and 13′5.*

BUILD A VILLAGE (series of six) 6d., *post free 9d.*

COMPLETE MODELLER, 4′-, *post free 4′6.*

TRAVEL BOX (series of six) 2′6 each, *post free 3′-.*

Post free rates for Great Britain, abroad extra.

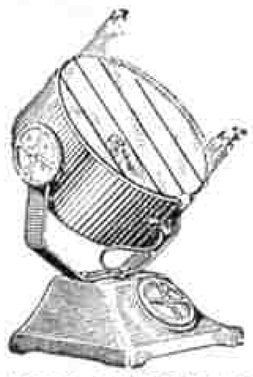
H A R B U T T ' S

Plasticine

Write for illustrated price list to:

HARBUTT'S PLASTICINE LTD., 99, BATHAMPTON, BATH

BRITISH MADE **ASTRA** TOYS OF QUALITY



REAL WORKING MODELS

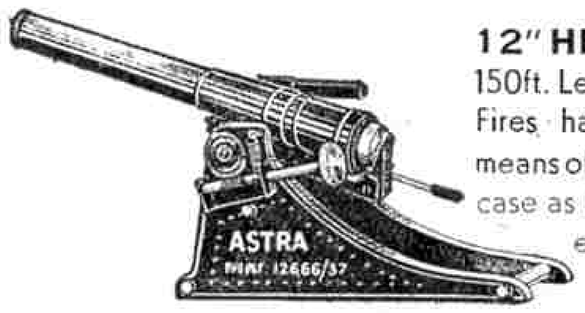
SEARCHLIGHTS. 300 ft. beam, **3/6.** 450 ft. beam, **4/11.** Super Searchlight, as illustrated, tremendous range, **7/11.**

ANTI-AIRCRAFT GUN. Fires on similar principle as 12" Howitzer. Price **3/6.**

Both these guns are amazingly powerful and accurate and give a very loud report. The operation is extremely simple and reliable.

Also model Traffic Signals, Harbours, Lighthouses, Aerodrome Floodlights, Aero Launching Decks with Indoor Flying Planes and other original models.

OBTAINABLE AT ALL GOOD STORES AND TOY SHOPS

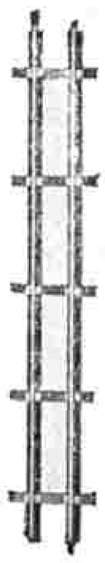


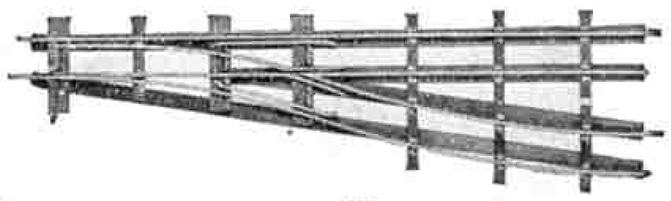
12" HEAVY HOWITZER. Range 150ft. Length 10½ inches. Price **10/6.** Fires harmless rubber projectiles by means of ordinary caps loaded in a shell case as in a real gun. Smoke and flash emitted from the barrel

Insist on genuine ASTRA products.

Catalogue post free from the sole inventors, manufacturers and patentees:

ASTRA PHAROS LTD.
LANDOR ROAD WORKS, SHEPHERDS BUSH, LONDON, W.12
Telephone: SHEPHERDS Bush 2472





Metalway

Constructed from solid drawn steel rails, cast super detail chairs (with key cast in), stained wood sleepers and battens and brass fishplates.

18" Straight or Curved 7½d.

or build with

L.M.C. MATERIALS

STEEL RAILS, 3" lengths	1/6	per dozen
Cast Chairs, PW/5...	1/9	„ gross
Sleepers, 3" stained	2/3	„ „
Battens, 18" stained	9d.	„ dozen
Spikes, approx. 500 steel ...	3d.	„ pkt.
Fishplates, brass	4d.	„ dozen

Post extra

Please send me per return { Fully illustrated catalogue for which I enclose 6d.* / 3-page leaflet free of charge.* } *Strike out that not required.

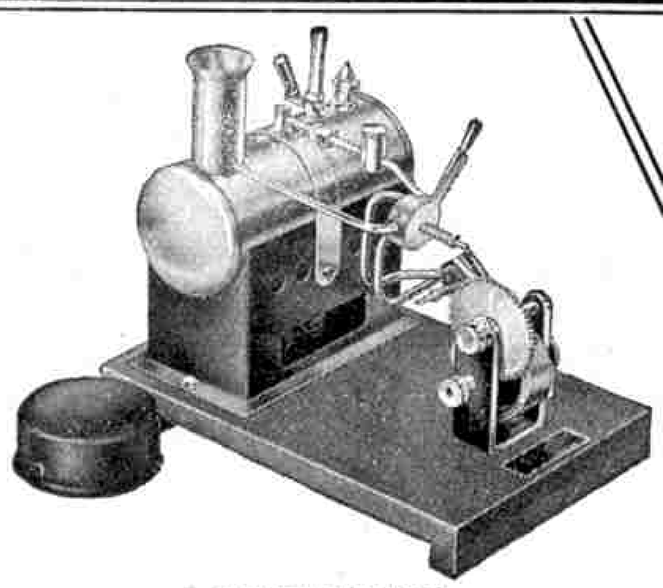
Name.....

Address.....

.....

THE LEEDS MODEL COMPANY LIMITED
Potterdale Mills, LEEDS, 11

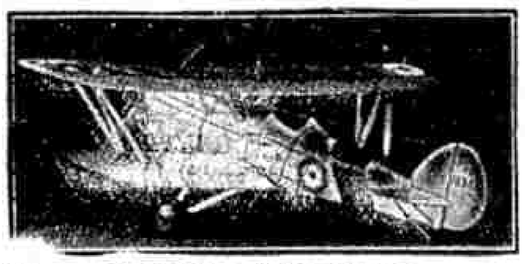
THRILLS GALORE IN STORE!



STEAM ENGINES

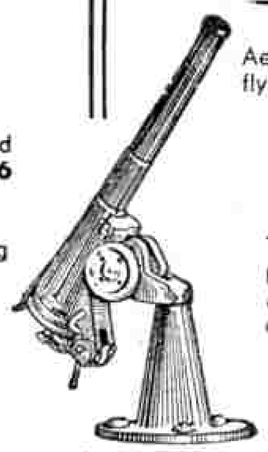
Powerful and reliable. British-made throughout. Tested under pressure and guaranteed. Price from **12/6**

TAPPER SETS. The latest signalling device, featuring the Tri-Signal, Buzz, Tapper and Flash. Sends and receives signals. **7/11** complete with batteries.

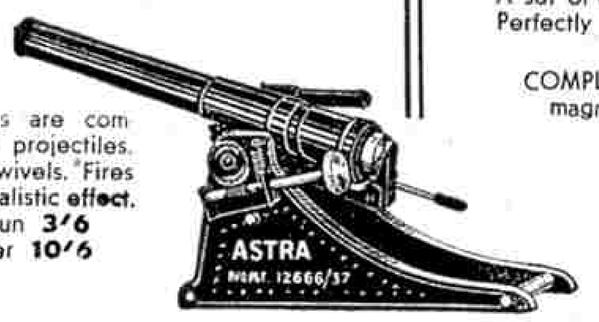


MODEL AEROPLANES

Aeroplane Kits for construction, both flying and non-flying, by all the leading makers.



A.A. GUNS



These Guns are complete with projectiles. A.A. gun swivels. Fires caps with realistic effect.
A.A. Gun **3/6**
Howitzer **10/6**

HOWITZERS

CARPET BOWLS

A set of eight Bowls, beautifully made in black Bakelite. Perfectly balanced for use on the Carpet.
Sets from **10/6**

COMPLETE MICROSCOPE SETS, giving high power magnification. For the boy with scientific inclinations.
Price **3/-** to **7/6**

MICROSCOPES

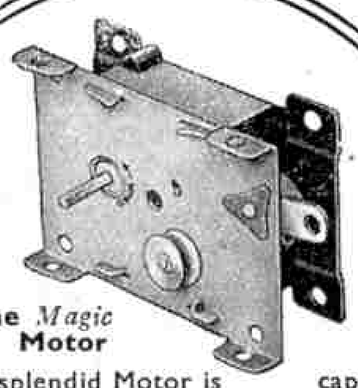
MODEL TELEGRAPHS

Lucas's stock a full range of spare parts and accessories. Here is a chance to augment your Christmas and New Year's gifts.

See our special display of Meccano and Hornby Trains.

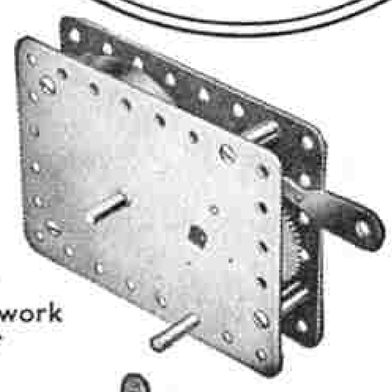
LUCAS'S

THE BOYS' ARCADIA
17, Houghton Street, Clayton Square
LIVERPOOL 1. Tel. Royal 562

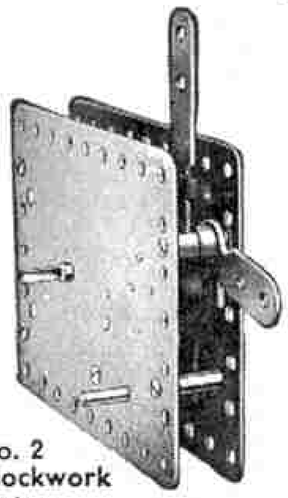


The *Magic* Motor

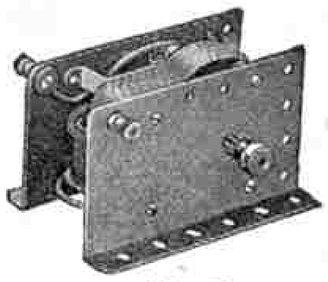
This splendid Motor is capable of driving models made with Meccano Outfits Nos. O, 1, 2, 3 and 4. It costs only 2/-.



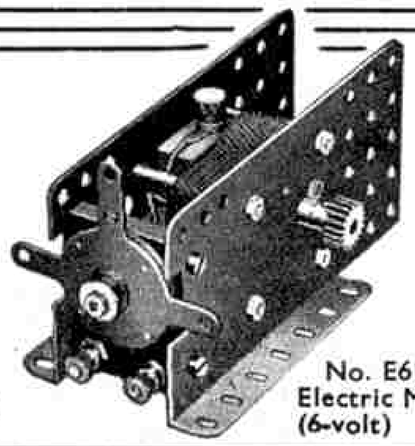
No. 1 Clockwork Motor



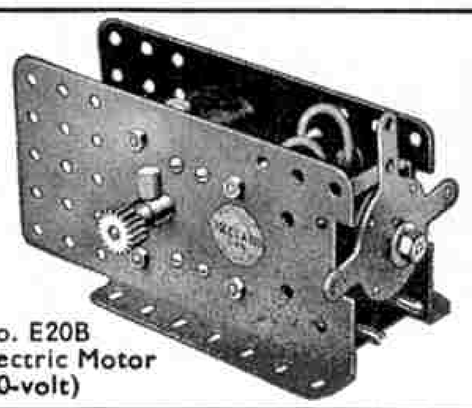
No. 2 Clockwork Motor



No. E1 Electric Motor (6-volt)



No. E6 Electric Motor (6-volt)



No. E20B Electric Motor (20-volt)

No. T20 Transformer

MECCANO

MOTORS FOR DRIVING MODELS

If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Clockwork or Electric Motors listed below.

CLOCKWORK MOTORS

The *Magic* Motor (non-reversing) ... ... Price **2/-**
No. 1 Clockwork Motor (non-reversing) ... ,, **4/6**
No. 1a Clockwork Motor (reversing) ... ,, **6/6**
No. 2 Clockwork Motor (reversing) ... ,, **9/-**

ELECTRIC MOTORS

No. E1 Electric Motor (6-volt). Non-reversing Price **7/6**
No. E6 Electric Motor (6-volt). Reversing ... ,, **12/9**
No. E120 Electric Motor (20-volt). Non-reversing ,, **7/6**
No. E20B Electric Motor (20-volt). Reversing ,, **13/6**

TRANSFORMERS

The Transformers made by Meccano Limited provide a convenient and safe means of driving 6-voltor 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

When ordering a Transformer the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

No. T6A Transformer (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors. Fitted with speed regulator and separate circuit for supplying current for eighteen 3½-volt lamps ... ... Price **22/6**

No. T6 Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors. Fitted with speed regulator. Price **17/6**

No. T6M Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors. This is similar to No. T6, but is not fitted with a speed regulator ... ... Price **12/6**

No. T26M Transformer (Output 50 VA at 9 volts) for 6-volt Electric Motors. Not fitted with speed regulator. Will operate two Meccano 6-volt Motors simultaneously.

No. T20A Transformer (Output 35 VA at 20/3½ volts) for 20-volt Electric Motors. Fitted with speed regulator and output sockets for lighting fourteen 3½-volt lamps. Price **22/6**

No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors. Fitted with speed regulator. Price **17/6**

No. T20M Transformer (Output 20VA at 20 volts) for 20-volt Electric Motors. This is similar to No. T20 but is not fitted with speed regulator ... ... Price **12/6**

No. T22M Transformer (Output 50 VA at 20 volts) for 20-volt Electric Motors. Not fitted with speed regulator. Will operate two Meccano 20-volt Motors simultaneously.

OUT ON JANUARY 24

Complete Book of the Air

MARVELS OF FLYING

A Real Super-Production full of fascinating articles, and illustrated with Unique Photographs

4-COLOUR COVER

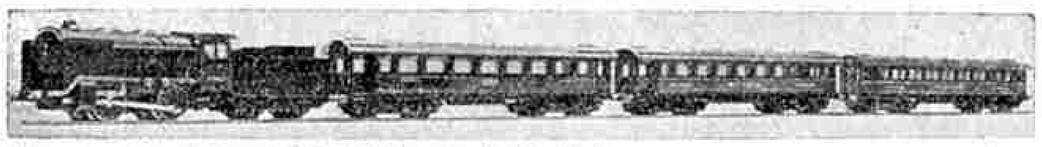
16 PAGES IN COLOUR

ORDER YOUR COPY NOW!

of all Newsagents – Price 6ᵖ

BOND'S

The PERFECT MINIATURE RAILWAY MAERKLIN "00" SYSTEM



With the Maerklin "OO" 20-volt A.C. Railway you can run any make of rolling stock on the track and do **not** need insulated wheels. Also it is perfectly controlled from a switch, with no reversing troubles at points. You always know which way the loco will start, without having to remember which way it was going the last time.

PRICES:

Locomotive 0-4-0 with tender	12/6	Wagon with Awning	2/-
Streamlined 0-4-0 loco with tender	15/-	Curved Rails	9d.
Diesel Rail Car 0-4-0	15/-	Straight Rails	9d.
Electric Outline Loco 0-4-0	12/6	Connecting Rail	1/9
Reversing Regulator Switch and Loco Adaptor complete	18/-	X Crossing	3/6
Loco Adaptor only	4/-	Points L.H. or R.H.	3/9
Coaches, Passenger, Diner, Sleeper	3/-	Electric Controlled Points	6/3
Luggage Van	3/6	Electric Colour Light Signals, hand-controlled	3/9
Open Truck	1/3	Ditto with Track Cut-out Control	7/6
Box Van	1/6	Ditto Electric Controlled	11/6
Fibre Wagon	2/-	2-Button Control Switch for Signals or Points	2/3
Petrol Wagon	2/-	Buffer Stop	1/-
Crane Truck	3/-	Station Lamps	2/-
Low-sided Wagon	1/3	Viaduct Bridge	2/9
Side-tipping Wagon	1/6	Transformer 220-240 volts	17/6
Banana Wagon	1/6		

All prices plus postage.

Send for Bond's 1938 200-page Catalogue if you are interested in Model Making. Price 6d. It contains everything wanted by the Model Maker, including all Tools and Materials.

BOND'S 'O EUSTON RD. LTD.

357, EUSTON ROAD, LONDON, N.W.1

Telephone: Euston 5441-2 Established 1887

★You will be surprised to learn how cheap *real* Laboratory Apparatus is when you buy—

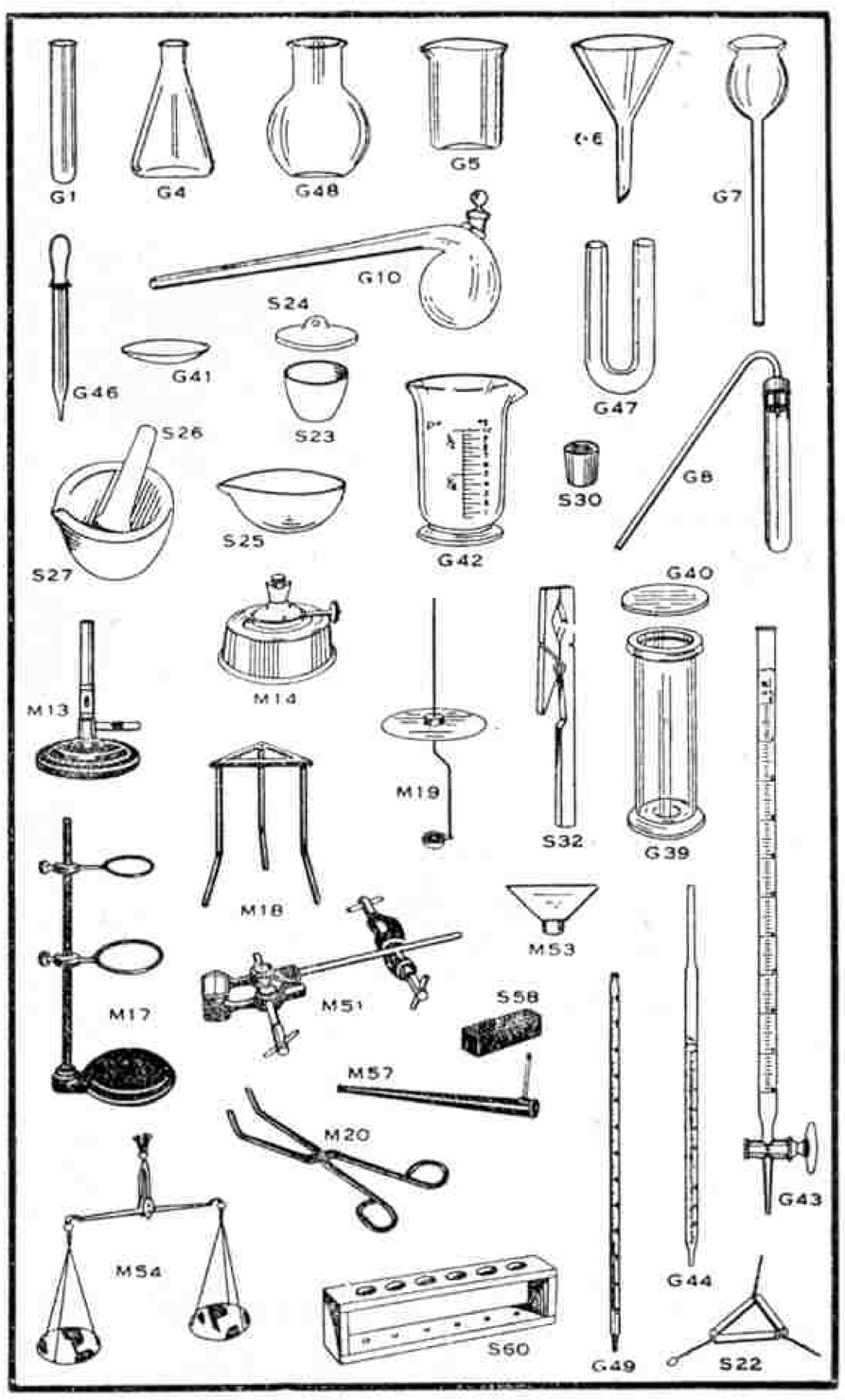
LOTT'S CHEMISTRY

SPARES

Just think what fun you could have with the extra apparatus illustrated. Exactly what you have always been wanting – you'll be able to invent a great many new and interesting experiments and learn to be a real scientist.

THIS SPARES LIST IS FREE!

Write today for your copy to Dept. M.M., Lott's Bricks Ltd., Watford, Herts. 1d. stamp on a postcard or 1½d. stamp on a letter, please.



There is no make-believe, every piece is exactly as used by our present-day Scientists

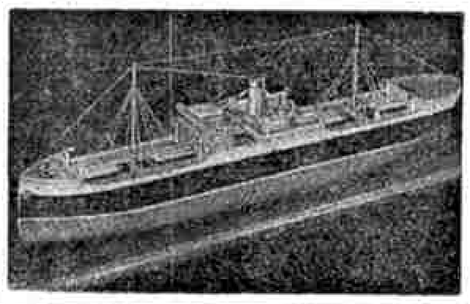
Lott's Chemistry SETS are priced as follows:

Box 1 ... 3′6 Box 2 ... 5′- Box 3 ... 8′6
Box 4 ... 12′6 Box 5 ... 21′- Box 6 ...27′6
and up to 105′-

LOTT'S BRICKS LTD., WATFORD HERTS.

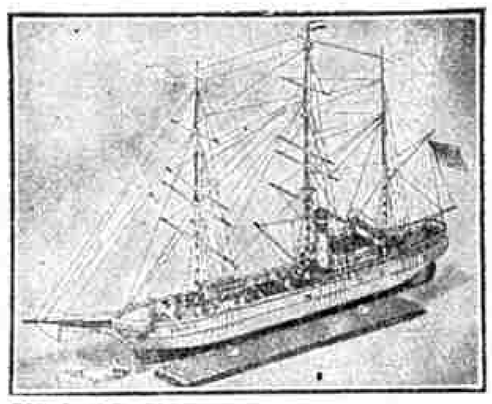
MODEL BUILDERS—try these fascinating Ship Kits

SPANISH GALLEON. Length 10 in. Splendid model. Big value kit complete, balsa for hull, masts, cement, lacquers, etc. Carriage paid **2'6**

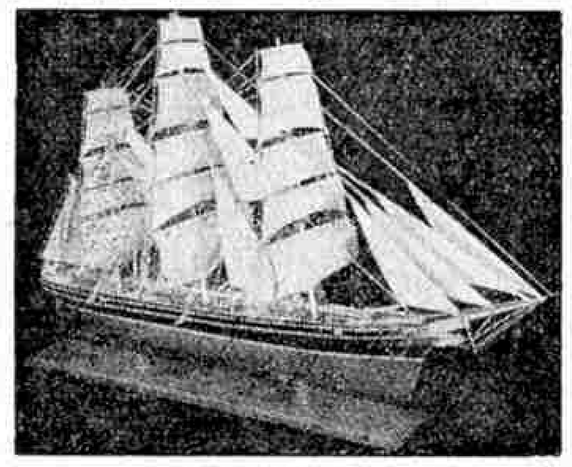


CARGO STEAMER. Length 14 in. Detailed full size plan. Easily built. Absolutely complete kit. Carriage paid **4'-**

CATALOGUE: Send 1½d. for most interesting and detailed 12 pages illustrating 17 kits, and accessories. Abroad, all kits 2/- each postage extra.



CITY OF NEW YORK. Length 14 in. Fascinating model, detailed plan. Complete kit, carriage paid **4'-**



CUTTY SARK. Length 14 in. Very detailed model. Large full size plan, exceptionally complete kit, many ship fittings. Carriage paid **4'-**

SEND YOUR P.O. TO-DAY to
M. SWEETEN Ltd., Bank Hey Street, BLACKPOOL

Build your own engine

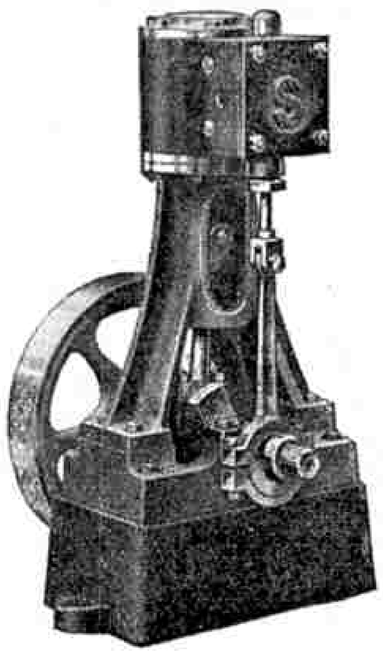
Only a few hand tools required.

Stuart No. 10.
Completely machined set with full instructions:
from **18/6** post free.

All our sets from 5/– upwards, illustrated and described in our No. 2 catalogue, 6d. post free.

72 pages fully illustrated.

STUART TURNER LTD.
Henley-on-Thames



Here is a new and interesting booklet produced in answer to the popular demand of Hornby Railway enthusiasts. It contains a wide selection of attractive rail formations, varying from quite simple layouts to more ambitious designs with double track. The best possible uses of Hornby Rails, Points and Crossings are clearly demonstrated.

The booklet is obtainable (Price 3d.) from any Meccano dealer, or (Price 4d.) post free, direct from

MECCANO LIMITED
Binns Road, Liverpool 13

THE LATEST SPORTS ISSUE
is included in this month's free gift of 21 beautiful pictorial stamps, including Coronations and Jubilees. Send 2d. postage for approvals and particulars of 35 different free gifts.
C. A. MASTERS, BROADSTONE, DORSET

1000 DIFFERENT STAMPS 3/9
Post Free—(Abroad 3d. Extra)
N. MOSELEY, Central Market, Cardiff.

FREE A "Worth While" Offer **FREE**
THE ELUSIVE
10D. IRISH USED
Have You got this Stamp in Your Collection?
NO?
Then send 1½d. Stamp for Postage. Ask to see some "Worth While" Approval Sheets and receive this RARE Stamp FREE.
"Worth While" Sheets for Stamps Worth While.
JOS. H. GAZE,
21. ATWOOD ROAD, DIDSBURY, MANCHESTER.

FREE to approval applicants enclosing 1½d.
MINT AIR MAILS
From Great Lebanon, Hungary and Indo-China.
E. P. ROSS 72, Watling Street, Church Stretton, Shropshire.

LOOK! HALF PRICE SALE
For a limited period only, I am clearing my approvals at half the usual prices. Send a P.C. to-day for a selection. Bargains galore.
CHAS. A. HILL, 45, QUEENS AVENUE, DOVER, KENT.

FREE! 4 CORONATIONS
From Kenya, Malta, etc., to genuine applicants for my cheap approvals. Generous discount. Postage 1½d.
A. K. DOLWIN, 279, GRAYS INN ROAD, LONDON, W.C.1.

TWO POPULAR LINES FROM THE WIDE RANGE AT

RAVEN'S STORES

★**KRAZEE-FOOTA.** The new game for the winter, is very popular, and creates roars of laughter. Made in three sizes from polished ply-board. For two players **6'3** and **8'3**, for four players **11'3.** Post free.

★**YOUNG WIRELESS OPERATOR.** Here is an excellent outfit, 2 Buzzer sets with morse code printed on each. Tapping keys are provided on both instruments, the words tapped out on one being audibly recorded on the other so that messages may be sent from one room to another. The specially manufactured Buzzers possess, among other advantages, silver contacts. Price **5'6** including battery. Post free.

THE COMMAND CAR. We have sold hundreds of this amazing toy, it obeys the voice, you say **GO** and it goes! say **STOP** and it stops. **3'9** post free, 2 for **7'-.**

RAVEN'S TWIN TRAIN. A complete stock of this is kept ready for despatch. It is still the greatest little train on earth.

Carriage paid in U.K. on all orders over 5'-
Under 5'-, 3d. extra

RAVEN'S, SOUTHEND-ON-SEA

ACCORDIONS from 1/6 weekly

SAXOPHONES - TRUMPETS
GUITARS - DRUMS
all by the World's finest makers.
ACCORDIONS by HOHNER.
On Britain's easiest terms. Most instruments with **FREE** tuition.

FREE—VALUABLE NEW YEAR GIFTS TO ALL PURCHASERS.

FREE

MAX MAMELOK *offers* :— FREE his 68 page catalogue containing hundreds of illustrations and packed full of valuable information. Send NOW for your FREE and POST FREE copy of this wonderful catalogue, also, if you are interested in the Guitar for free copy of "Fretted Harmony."

MAX MAMELOK
Musical Instrument Specialist
MAMELOK Bros Ltd
Department M.M.,
29-35, Oxford Road, Manchester, 1

IS
CHEMISTRY YOUR HOBBY?
If so, write now for our Catalogue of Laboratory Equipment which contains a full range of apparatus and chemicals to meet the requirements of every student.

SETS FROM 2/6 TO 105/- POST FREE

Booklet of Tested Experiments, 6d. post free.

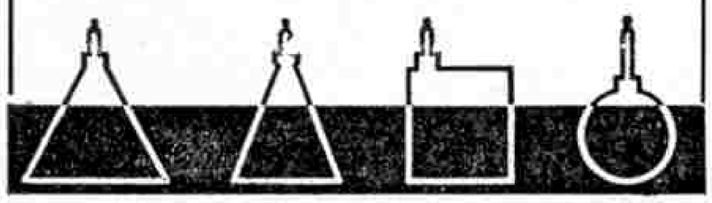
BECK (Scientific Dept. G), 60, High St., Stoke Newington, London, N.16

THE WEBLEY SERVICE AIR RIFLE MkII
NO LICENSE REQUIRED TO PURCHASE

WRITE FOR DESCRIPTIVE FOLDER

This extremely accurate and powerful Air Rifle is ideal for Target Practice in the garden or for exterminating Rats and similar vermin.
Calibre 22 or 177. With leafsight and peepsight.
Webley & Scott Ltd., 87, Weaman St., Birmingham 4

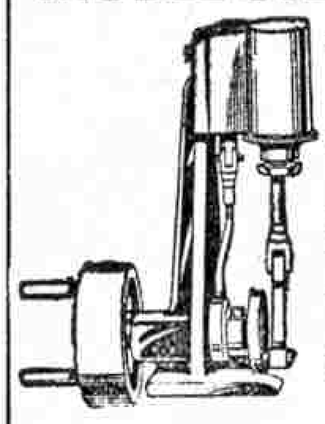
OIL IS ALWAYS HANDY WHEN KEPT IN A MODERN
"Valvespout"
LEAKPROOF OILCAN
Ask your Dealer to show them to you, or write to us for a coloured brochure.
Parker-Hale Ltd., Birmingham, 4.



CINEMATOGRAPHS British Made from 37/6
CINEMATOGRAPH FILMS
Standard Size only. Write for Catalogue, post free. Sample Film and Catalogue **1/-** and **2/6.**
Filmeries Co., 57, Lancaster Rd., Leytonstone, E.11

BE TALL Your Height increased in 14 days or money back! 3-5 inches rapidly gained. Amazing Complete Course sent for **5/-** P.O., or details free. Write **Stebbing System, Dept. M. 28, Dean Road, London, N.W.2.**

MODEL STEAM FITTINGS and MARINE ENGINES



DOUBLE ACTING PISTON VALVE
½ in. bore. ⅝ in. stroke. **7/6.** Postage 4d.
Oscillating $\frac{7}{16}$ in. x 1 in. **4/6**
Miniature ⅜ in. x ⅜ in. **3/-**

PROPELLER SHAFTS
Complete stern tube and gland.
Rigid 7 ins. ... ... **11d.**
Flex 9¾ ins. ... ... **1/-** } Postage 3d.
Propellers. 1½ ins. **8d.** 2 ins. **10d.** Post 2d.
Write for Catalogue, 2d.
F. YATES & SON LTD.,
144, CHURCH ST., KENSINGTON, LONDON, W.8.

MODEL DRIVING MADE EASY!
The "Wilco" way has come to stay

Here is a splendid 1/40th h.p. **Mains Motor.** Just plug in to your 200/250 volt A.C. supply. Runs your models fast or slow, gives 58 r.p.m. on load. A geared motor that will last a lifetime. Just the thing for Meccano and other models. Powerful and safe.

Post Free **30/-**

Other models from 17/6. See 44-page Catalogue, 4d. post free, or presented with every order.
L. WILKINSON, 204, LOWER ADDISCOMBE ROAD, CROYDON.

The **"BANDMASTER"**
KING OF HARMONICAS

For Bands
For Parties
EVERY BOY SHOULD HAVE ONE
Obtainable from Music and Toy Shops at Popular Prices

TRIX TWIN TRAINS
and accessories. Safe delivery guaranteed. Postage free. C.O.D. if desired. **Models taken in exchange.** Lists.
Georges', 11, Friars Street, Ipswich.

TOOLS for the MODELMAKER
3/- bargain lots, post free.

Lot 101. 12 High Speed Twist Drills.
Lot 103. 144 Modelmaker's Screws & Nuts.
Lot 110. 20 feet Silver Steel assorted.
Lot 112. 3 Round BA Dies, with Taps.
Lot 113. 3 „ Whit „ „ „
Lot 114. 36 Hack Saw Blades.
Lot 117. 750 assorted Woodscrews.
Lot 118. 12 Files, assorted, to 6 ins.
Lot 123. 6 Grinding Wheels, to 4 ins.
Lot 124. 500 Nuts, Screws & Washers.
Lot 125. 50 assorted Drills, to 1/16th ins.

Send for complete range to:
M. GRAYSON & CO., CAMPO LANE, SHEFFIELD, 1.

Don't

be a subordinate all your life

What you put into your head while still young decides what sort of a position you will occupy later on. Brain, *trained* brain, is the power that wins a position of responsibility and a good income. You must be systematically trained in the work of your choice, and that, usually, is only possible in spare time. "Tell me how a young man spends his evening hours," a great industrial leader has said, "and I'll tell you whether he will achieve success or remain a subordinate."

The International Correspondence Schools offer you the training you may need. There is none better, none more convenient for the student. It was the I.C.S. that made the postal method of instruction what it is today, and the I.C.S. remains the greatest institution of its kind in the world.

I.C.S. Courses cost no more than those of other reputable schools teaching by correspondence; indeed, in some cases they cost less. An important consideration lies in the fact that all I.C.S. instruction books and special textbooks are supplied without extra charge. The students of many postal concerns have to buy the books required, that often involving an expenditure of several pounds.

WRITE TO-DAY FOR FREE BOOKLET and advice on any one or more of the following subjects:

ACCOUNTANCY
ADVERTISING
AERONAUTICAL ENG.
AGRICULTURE
AIR CONDITIONING
ARCHITECTURE
BOOK-KEEPING
BUILDING
CHEMICAL ENG.
COMMERCIAL ART
COMMERCIAL TRAINING
CIVIL ENGINEERING
DIESEL ENGINEERING
DRAUGHTSMANSHIP
ELECTRICAL ENG.
FRENCH AND SPANISH
GENERAL EDUCATION
HORTICULTURE
INSURANCE
JOURNALISM
MARINE ENGINEERING
MECHANICAL ENG.
MINING
MOTOR ENGINEERING
PLUMBING
RADIO
SALESMANSHIP
SANITARY ENG.
SCIENTIFIC M'G'MENT
SECRETARIAL WORK
SHORT-STORY WRITING
SURVEYING
TELEVISION
TEXTILE MANUF'G
WORKS MANAGEMENT
WINDOW DRESSING
WOODWORKING

EXAMINATIONS:
Technical. Professional. Civil Service. Matriculation.

INTERNATIONAL CORRESPONDENCE SCHOOLS LTD.
Dept. 218, International Buildings Kingsway, London, W.C.2

READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Meccano Electric Motor, complete with Lampboard, 100-230-volts, as new, only used twice, perfect, 17/6.—Hancock, 6, Pelham Road, Southsea, Hants.

"Meccano Magazines" for sale, 1927–1937. What offers?—C. Pickering, 68, Cole Park Road, Twickenham.

Sale. 45/- worth Red-Green and Nickel-plated Meccano, excellent condition, includes 5/- Clockwork Motor. Offers?—Smith, Whitehall, Poplar Avenue, Saddlebow, King's Lynn.

Sale. Gauge O Clockwork Railway, six Engines, seven Pullmans, 60 Stock, etc. Cost £25. As new. Cheap. Stamp list.—Tyrer, 21, Gaisford Road, Cowley, Oxford.

What offers? Two No. O Gauge Locos, condition of both as new, and several dozen Metal Rails, and Cross Rails on wooden sleepers. The latter available separate or assembled. Also Bassett-Lowke Electric Engine and Coach, and quantity of Nickel-plated and Red-Green Meccano for disposal. Write for particulars to—J. K. Blamey, "Trelawny," Dean Row, Wilmslow, Cheshire.

Wanted. Super Model Leaflets, Numbers 16, 26, 27, 36, 37. Channel Segments also wanted.—G. Pratt, 4, Branstone Road, Kew Gardens, Surrey.

British Colonial Collection, 1,060 approx. all different, including 50 Jubilees, £2/10/-. Satisfaction guaranteed. Owner uninterested.—Burditt, Ingoldmells, Nottingham Road, Hucknall, Notts.

Sale. Gauge O Railway, two Locos, Rolling Stock, Accessories. Excellent condition. Cost £7. Offers. Also Stationary Steam Engine.—Levitt, 21, Blackheath Park, Blackheath, London.

Sale. Unused Stamp, Samoa Express, cat. 27/6. What offers? Wanted. Cheap Typewriter.—Pollard, Oak Farm, Rush Green, Lymm.

Pathe surplus Films, Supers, 60's and 30's, good condition. Write for lists.—85, Killinghall Road, Bradford.

Sale. Gent.'s Bicycle, 55/-; Boy's Bicycle, 20/-; Gauge "O" Railway, three Locos, 70 ft. Track, etc., 80/-.—P. Brown, 19, Shaa Road, London, W.3.

Sale. "M.M.'s," January 1930–December 1937. Complete. As new. £1 or offers.—Condon, 98, Whitmore Gardens, Willesden, N.W.10.

Wanted. Second-hand Gauge "OO" Trix Twin Lines, Points and Transformer.—Deburiatte, "Glenlyn," Knox Road, Havant, Hants.

Sale. No. 6 Meccano Red-Green, splendid condition, many additions, including Electric and Clockwork Motors. £3 or offer.—Reditt, Avon House, Cringleford, Norwich.

Sale. Number 100 Constructments. Cost 37/6. Accept 15/- or nearest.—Greenshaw, "Ludhill," Willerby, East Yorkshire.

£3/10/- Set H Meccano, many expensive extras, nearly new. 20-volt Motor, reversible and Transformer. Absolute bargain.—61, Derwent Road, Palmers Green, N.13.

Sale. Steam Locomotive in excellent running order, 12/6.—Campbell Cooke, Petersfield, Hants.

For Sale. 100 ft. of Bassett-Lowke "Lowko" Track. Also Gauge O Rolling Stock. Send stamp for list.—R. Gauntlett, 20, South Park Road, Wimbledon, London.

Sale. Red and Nickel-plated Meccano, nearly equivalent late No. 5; One Clockwork Motor. Good condition, 35/- or nearest offer.—Bussey, 1, Helena Road, Norwich.

Bargain Sale. O Gauge Loco, Track and Rolling Stock. Excellent condition. All about half price. Sell separately, or, if altogether, at 20% discount. Also endless variety Toys, Games, Puzzles, Books. Lists free.—Spencer, Oak Dene, Carr Road, Burnley.

Bargain. Adana Printing Machine with Type and all Accessories. Splendid condition. Cost £12, take £9, or near offer.—Heath, 5, The Grove, Finchley, N.3.

Red-Green Meccano Set, good condition, £2; Pair Roller Skates, ball bearing, 5/-.—Ogilvie, Field Cottage, Weald Road, Sevenoaks.

Write for free list of Books and Magazines. Genuine bargains.—Smith, 29, Roydon Grove, Lincoln.

Bassett-Lowke Electric Engine, 11 inch. Good condition, 14/-.—Beet, 275, Pershore Road, Birmingham.

Sale. One Royal Scot, B-L, Gauge "O," 6-volts; 24 yards Track, unused; Lifting Bridge and Accessories. Good condition. £3, or offer.—Rees, Kempes Hall, nr. Ashford, Kent.

Sale. "M.M.'s," 1928–1932, bound; 1933–1935, unbound. Lot or separately. Offers?—Lennard, 22, Lillington Road, Leamington, Warwickshire.

"ELECTRIC HOME CINEMAS STANDARD FILMS." Bargain lists free. Pictures, 109, Kenlor, Tooting.

BOYS. 10,000 American, Model, Science, Aviation, Radio, Mechanic Magazines, Books, Samples and Catalogue, 2/6. G. A. Final, 15, Nashleigh Hill, Chesham.

WEBLEY AIR PISTOLS

Marvellously accurate for target practice.
No license required to purchase.
Senior 45/-, Mark 1 32/6.
Junior 21/-, Webley Air Rifle 95/-
Write for List. WEBLEY & SCOTT LTD.,
87, WEAMAN STREET, BIRMINGHAM, ENG.

This Month's Special Articles

	Page
Air News	24
Books to Read	34
Canal Barges in the Making	27
Capetown and Back in Six Days	7
"*Carborundum*" Crucibles	2
Competition Corner	63
Conquest of the Dead Sea	22
Engineering in Agriculture	40
Engineering News	8
Fireside Fun	64
From Our Readers	38
Guild Pages	48–49
Hafner Gyroplane	6
Hamilton Power Presses	12
Hornby Railway Company Pages	51–56
How Insects Protect Themselves	30
L.N.E.R. "No. 10000" Rebuilt	21
London's Collier Fleets	16
Making Talking Films Outdoors	13
Model-Building Competitions	46
Model-Building Competition Results	47
New Meccano Models	42–44
Notable Indian Locomotive Design	36
Old Coaching Days	14
Railway Developments in South Africa	57
Railway News	18
Skye Boat Express	4
Speeding Up the "*Arundel Castle*"	26
Stamp Collecting	59
Stamp Gossip	61
Testing Aero Engines	20
Traffic Signals in Piccadilly Circus	10
Unusual Models of 1937	28
With the Model-Builders	41

1,000 SHIPPING PHOTOGRAPHS

Send 3d. for specimen postcard and our Illustrated Lists of over 1,000 different real photographs of Liners, Freighters, etc., including Cunard-White Star, Harrison, Blue Funnel, etc., 2d. each, 2/- per dozen, postage free. Photographs of the new liners: "Awatea," "City of Benares," and "Queen Mary" now available.
B. & A. FEILDEN (M.M.),
12, Harlech Road, Blundellsands, Liverpool, 23, Eng.
(Trade Enquiries Invited.)

RAILWAYS, SHIPS & AEROPLANES
PHOTOGRAPHS: 3,000 SUBJECTS.
Over 54,000 postcards in stock.
Send 4d. for list and specimen card (stating section).
ALL PHOTOGRAPHS (postcard size) 3d. each. 2/6 per doz. (post free.)
REAL PHOTOGRAPHS CO.
(Dept. M), COOPER'S BUILDINGS, LIVERPOOL, 1.

CIGARETTE CARD COLLECTORS
Send for
OUR NEW FREE LIST OF 700 POPULAR SERIES
Post Free.
THE STANDARD CATALOGUE
SECOND (1937) EDITION
All available series, with many dates of issue, much general information, and full details of Albums and Accessories.
Price 1/2—Abroad 1/6. Post Free.
CIGARETTE CARDS AND HOW TO COLLECT THEM
By I. O. Evans.
The first complete book on the subject. Crown 8vo. copiously illustrated. **Price 3/6. Post Free.**
THE "CIGARETTE CARD NEWS"
The Card Collectors' Monthly Journal,
has now been
ENLARGED TO TWENTY PAGES
and
GREATLY IMPROVED, WITH MANY NEW FEATURES.
Specimen Copy **3½d.** Six Months' Subscription **1/9**, both Post Free.
THE LONDON CIGARETTE CARD CO. LTD., Room E, 30, Wellesley Road, Chiswick, LONDON, W.4.

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

STAMP ADVERTISEMENTS (*Cont. from Page 60*)

FINE STAMP, CAT. 2/6, to all approval applicants sending 3d. in stamps.—B. Rumbles, 80, Netherlands Road, New Barnet, Herts.

CORONATIONS, mint, used, F.D.C., at low prices. List or Approvals. Colonials, Newfoundland, Morocco, etc. 75 stamps free to first applicants. Mitre Stamp Co., 17, Philip Street, Rochdale.

100 diff. Stamps Free to approval applicants, good discount.—Gosling, 21, Powling Road, Ipswich.

Free! Rhodesian Stamp (Cat. 4/6). Request approvs. 1½d. stamp. Griffin, 93, Colin Deep Lane, London, N.W.9.

Stamps on approval from ½d. upwards. Good value given. Rogers, 30, Watling Street, E.C.4.

5 CORONATION STAMPS FREE. Post 2d. Sanders, 90, Newlands Avenue, Southampton.

LARGE COLLECTIONS OF STAMPS FOR SALE
Captain O. L. Beater, D.F.C., late of the Royal Flying Corps and R.A.F., a collector for more than thirty-five years, has many thousands of duplicate stamps for sale. Very pleased to send approvals or give free advice to those starting this fascinating hobby. **Captain Beater, Weston-on-Green, Oxfordshire**

PICTORIAL COLONIALS ONLY
I specialise in Brit. Col. approvals and will send you an absolute bargain selection of pictorial (Coronations if required). Do you want current, recent or what issues?
R. F. EMBLEY, 39, Cross St., St. Annes-on-Sea, Lancs.

STAMPS OTHERS HAVEN'T GOT
START the **NEW YEAR** well with our **BUMPER GIFT. TWO DIFFERENT PACKETS,** including **COLONIALS, NEW GREEK & AIR MAIL PICTORIALS, FREE** to applicants for Approvals (Triangs., Coronations, Air Mails, etc.) from ½d. sending 1½d. postage. No stamps sent Abroad.
E. F. HILL (N), 37, TEMPLE GARDENS, LONDON, N.W.11.

CHEAP APPROVALS
My beautiful Approval Selections are ideal for filling those vacant spaces. Pictorials, Colonials, and hard to get items. Selections from 4 a 1d. Free Gift Bi-coloured Persia all applicants.
A. V. TAPP, 26, WINDSOR ROAD, BRISTOL, 6.

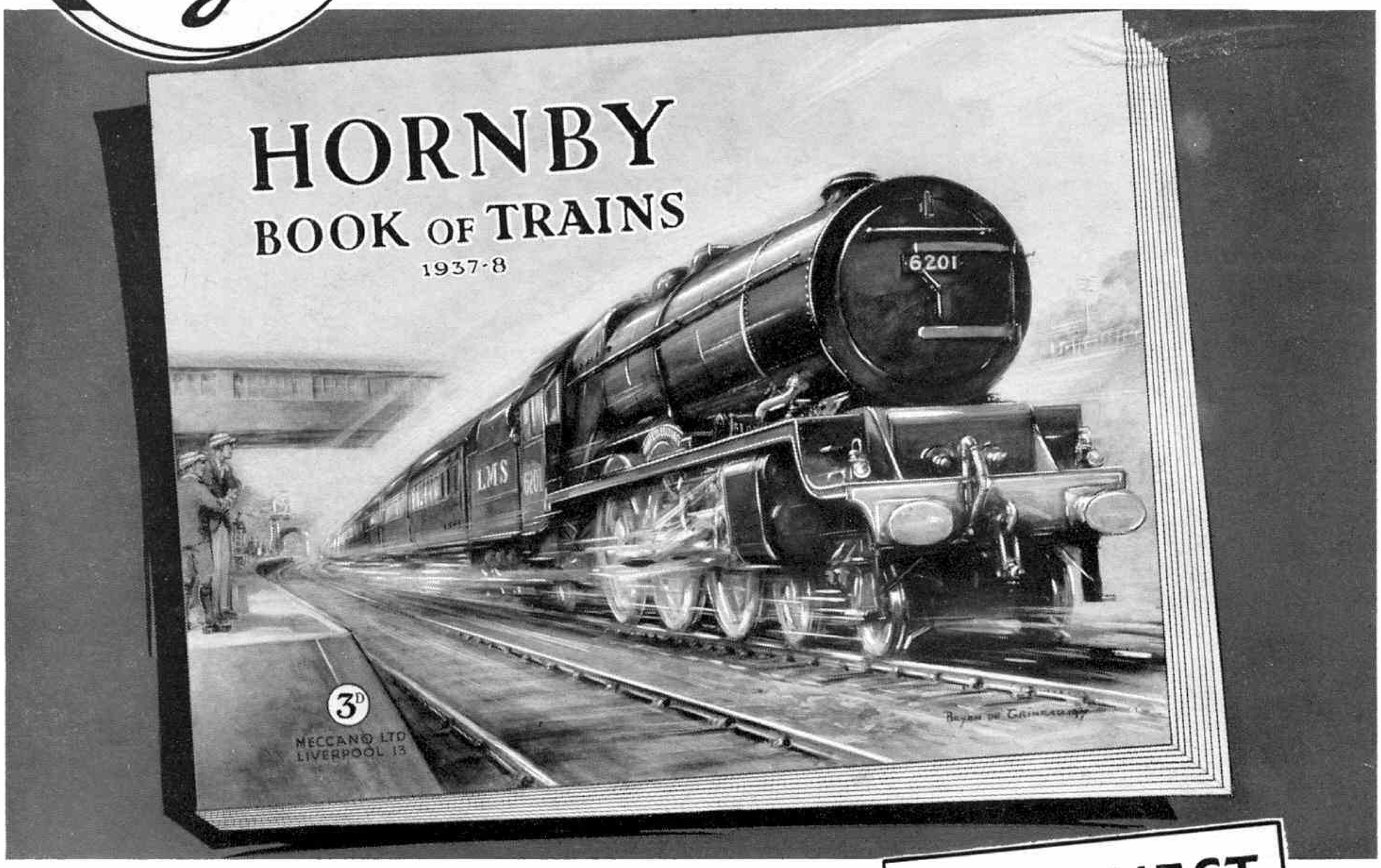
505 STAMPS FREE!!
This huge gift parcel contains **505 UNSORTED FOREIGN STAMPS,** many scarce from **SENEGAL** (fine pictorial), **GREECE, CHINA** (Dr. Sun Yat Sen), **CZECHO-SLOVAKIA, POLAND, JAPANESE** (1899), **JUGO-SLAVIA,** etc., etc. **FREE TO ALL** sending 2d. postage and requesting my **FAMOUS EXTRA-LARGE-DISCOUNT** approval sheets. (Abroad 1/- P.O.)
E. EASTICK, 22, BANKSIDE ROAD, BOURNEMOUTH.

STAMPAIGN'S Astounding **NEW YEAR** offer of sterling value **NAMED PACKETS,** each containing scores of different beautiful stamps including mint and used **CORONATIONS, SILVER JUBILEES, etc.: Spanker 6d.; Scrumptious 1/-; Splendiferous 1/6; Spellbinder 2/-; Superbia 2/6; Superfine 3/-; Stupendous 3/6; Stampaignia 5/-.** No two packets alike, and three packets for the price of two. Order now, on 'satisfaction or returnable' basis, and include 2d. postage. Not something for nothing, but utmost value to retain your custom.
STAMPAIGN, SALTFORD, BRISTOL.

FINE USED MODELS
Send 4½d. for our catalogue of perfect railway and model bargains with particulars of our purchase service.
Georges', 11, Friars Street, Ipswich.

Look Boys!

The 1937-8 HORNBY BOOK of TRAINS



Of absorbing interest to Railway enthusiasts

The 1937-8 issue of the Hornby Book of Trains is the finest that has ever been produced. It contains splendid articles, fully illustrated by photographs, dealing with British express trains and locomotives, the mysteries of an engine shed, the fascination of operating a miniature railway, and other interesting topics.

In addition the book forms a complete catalogue of Hornby Trains for electric and clockwork railways. The Hornby Locomotives, Rolling Stock and Accessories are beautifully illustrated in full colour.

How to obtain the Book

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

Readers living in Australia, New Zealand or South Africa who require copies should send their postal orders for 8d. (which includes postage) to the addresses given below. The Meccano Branch at Toronto will deal with Canadian orders and the price is 12 cents post-paid.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending 6d. in stamps with their order.

Overseas Agencies:

AUSTRALIA: E. G. Page & Co., 52, Clarence St., Sydney (P.O. Box 1832k).
NEW ZEALAND: Models Limited, Fayle's Buildings, Anzac Avenue, Auckland C.1 (P.O. Box 129).
SOUTH AFRICA: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).
CANADA: Meccano Ltd., 187-189, Church Street, Toronto.

Published by

MECCANO LTD. (Dept. A.M.), BINNS ROAD, LIVERPOOL 13

THE FINEST RAILWAY BOOK OF THE YEAR

GET YOUR COPY TO-DAY

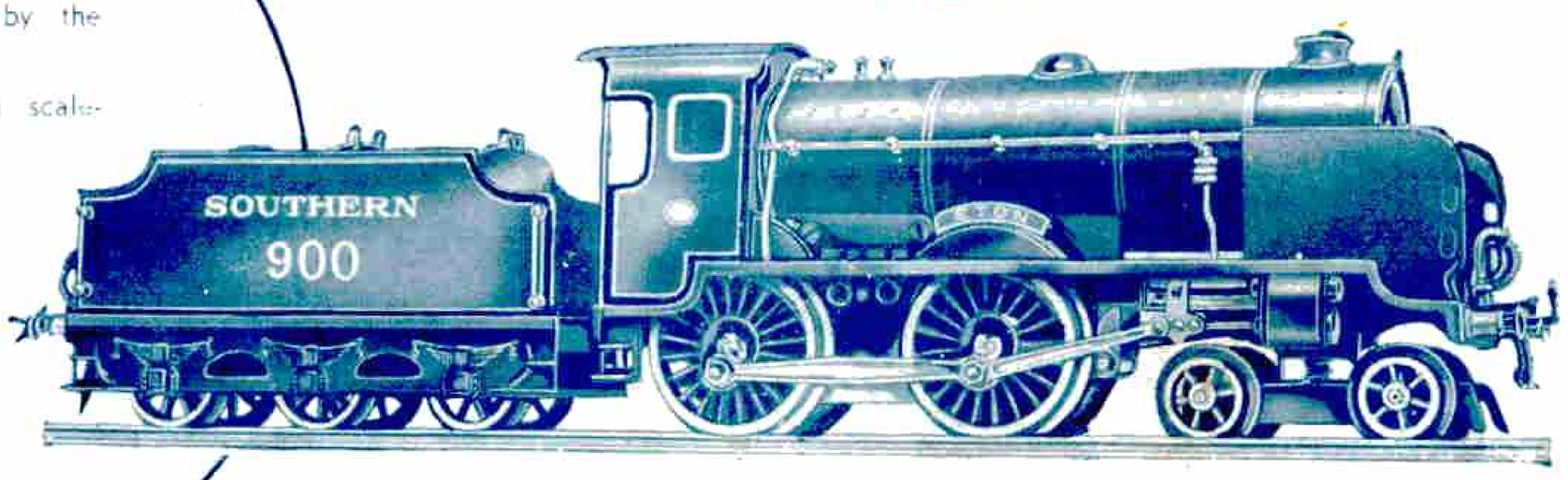
Price 3D.

HORNBY ELECTRIC & CLOCKWORK TRAINS

"ETON"

This is a fine scale model of the first member of the famous "Schools" class locomotives produced by the Southern Railway Company.

All who are interested in scale-model locomotives will welcome "ETON" both for its beauty and its fine performance. It has a 20-volt motor designed for running from alternating current mains supply through a Transformer. It is fitted with the famous Hornby REMOTE CONTROL



E420 "Eton" 20-volt electric Automatic Reversing	Price **42/6**
No 4c "Eton" Clockwork	Price **35/-**
Tender	Price **6/-**

You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

Hornby Trains represent the latest model railway practice, and is complete in every detail. There are Locomotives driven by electric motors or by clockwork. The Rolling Stock includes Pullman Cars, Coaches, Guard's Vans, and numerous Wagons and Vans.

The Accessories are now better than ever before, while with the Rails, Points and Crossings an endless variety of layouts can be constructed.

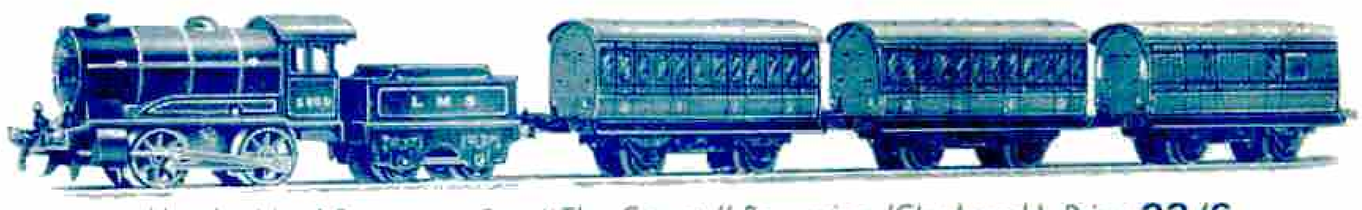
Hornby Train Sets are available at prices ranging from **15/-** to **72/-** for Electric models and **4/11** to **58/6** for Clockwork models.

Ask your dealer for full details of the Hornby Deferred Payments Scheme. (Not available outside Gt. Britain and Northern Ireland.)

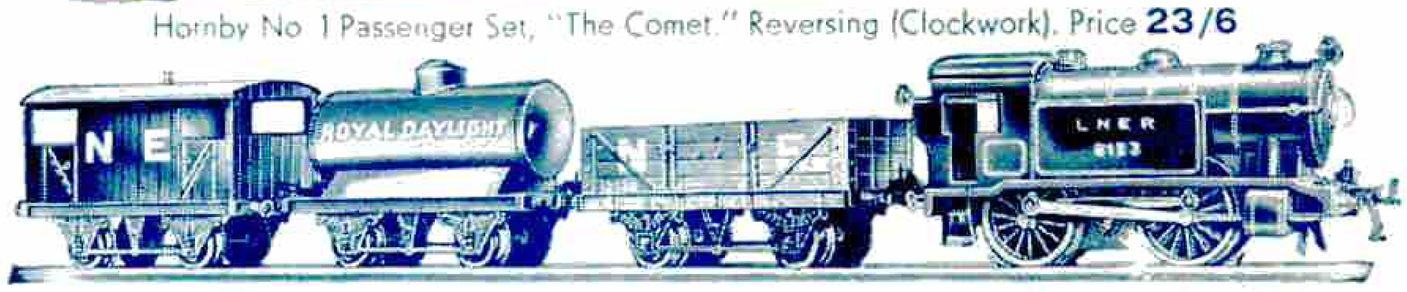
A SELECTION FROM THE RANGE OF HORNBY TRAIN SETS

Hornby No. 3c Passenger Set, "The Flying Scotsman." Reversing (Clockwork). Price **47/6**

No 2 Special Passenger Set, "The Yorkshireman." Reversing (Clockwork). Price **52/-**



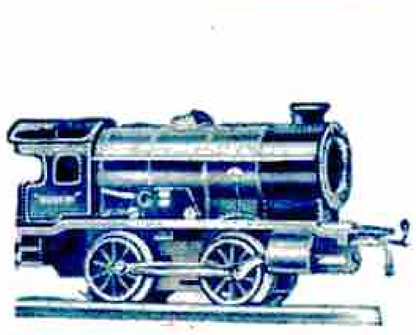
Hornby No 1 Passenger Set, "The Comet." Reversing (Clockwork). Price **23/6**



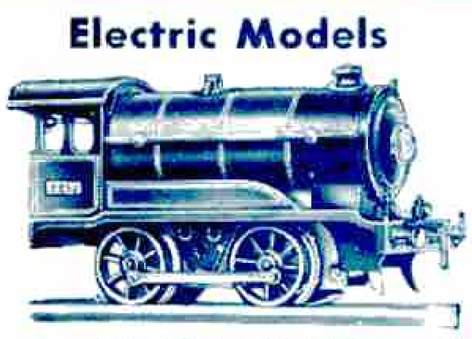
Hornby E120 Special Tank Goods Set. Automatic Reversing (20-volt Electric). Price **40/-**

A SELECTION FROM THE RANGE OF HORNBY LOCOMOTIVES

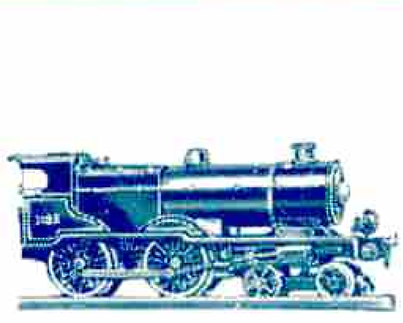
Electric Models



EM120 (20-volt) or EM16 (6-volt) ELECTRIC LOCOMOTIVE

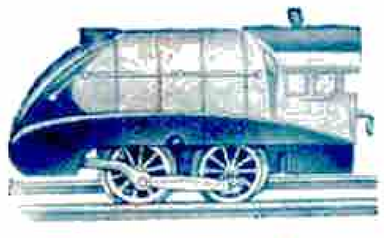


EO20 (20-volt) ELECTRIC LOCOMOTIVE

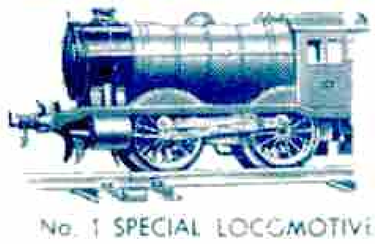


E220 (20-volt) SPECIAL ELECTRIC LOCOMOTIVE

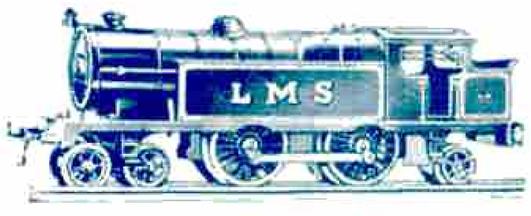
Clockwork Models



No. O "SILVER LINK" LOCOMOTIVE



No. 1 SPECIAL LOCOMOTIVE



No. 2 SPECIAL TANK LOCOMOTIVE

Electric Models

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing) Price **8/6**

EO20 (20-volt) Locomotive (reversing). Price **19/-**

E220 (20-volt) Special Locomotive (automatic reversing) Price **37/6**

Clockwork Models

No. 0 "Silver Link" (non-reversing) Price **3/6**

No. 1 Special Locomotive (reversing). Price **15/9**

No. 2 Special Tank Locomotive (reversing). Price **19/6**

PRODUCT OF

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13, ENGLAND
Printed by John Waddington Ltd., Leeds and London.